EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-01

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	09/01/2011 To 08/31/2013 Base Option Period Number 3	Decontamination of Soil

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: 3.1

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/01/2012 To 05/31/2013

Comments:
Work Assignment Amendment 01 shall revise final Deliverable Due Date from 3/31/13 to 5/31/13. No additional cost or LOE is required, therefore, no revised Contractor Work Plan is necessary.

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): 22

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
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5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	09/01/2011 To 08/31/2013		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Joe Wood (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-5029	
	FAX Number: 919-541-0496	
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 541-754-4502	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Charles McCormick (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2047	
	FAX Number:	

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-01

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Decontamination of Soil

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	3.1 Testing and Evaluation Process

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 03/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/2012. No work shall be performed by the contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 10/21/2009 To 08/31/2013 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name Joe Wood (Signature) (Date)	Branch/Mail Code: Phone Number 919-541-5029 FAX Number: 919-541-0496
Project Officer Name Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK
Contract EP-C-10-001 -- WA 3-01

I. TITLE
Decontamination of Soil using Metam Sodium

II. PERIOD OF PERFORMANCE
The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from September 1, 2012 – March 31, 2013.

III. SUMMARY OF OBJECTIVES
This work will provide data on the effectiveness of metam sodium decontamination technology to inactivate *B. anthracis* spores in soil. A report will also be completed to cover the results obtained under this SOW and also the study conducted in a previous Work Assignment (WA) under this contract (WA 2-01).

IV. RELEVANCE
The results of these tests will provide the decontamination technology user and stakeholder with high quality, peer-reviewed data on the effectiveness of a technology to decontaminate soil contaminated with *B. anthracis* spores and a surrogate. The results of the work will be made available to the homeland security and emergency response community through published reports, journal papers, and/or conference presentations/proceedings. The information will also be used to develop guidance documents pertaining to specific threat agents and release scenarios.

V. BACKGROUND
The U.S. Environmental Protection Agency (EPA) has the responsibility for protecting human health and the environment from accidental and intentional releases of hazardous and toxic materials. According to Homeland Security Presidential Directive 10 (HSPD-10), the EPA is tasked with developing strategies, guidelines, and plans for decontamination of persons, equipment, and facilities following a biological weapons attack. In response to this directive, the EPA Office of Research and Development (ORD) National Homeland Security Research Center's (NHSRC) Decontamination and Consequence Management Division (DCMD) is investigating methods and technologies for the inactivation of spores (e.g., *Bacillus anthracis* Ames) on materials/surfaces. This work will build on the decontamination studies that have already been conducted.

VI. SCOPE

The primary purpose of the study is to investigate the use of decontamination technologies for soil contaminated with anthrax. The decontamination technology to be tested under this WA includes metam sodium. Sufficient replicates, blanks, and positive controls shall be used, consistent with standard microbiological and quality assurance

procedures, past work conducted by the contractor, and studies being currently conducted by the contractor.

VII. TECHNICAL APPROACH

For each decontamination test, the effort shall include the recovery of viable agent from each material before (positive control) and after decontamination. Five replicates for each agent-material combination shall be included in each experiment. All experiments described below shall be approved by the EPA Work Assignment manager (WAM) prior to commencement. Test and analytical methods shall be adopted from past or on-going efforts, in consultation with the WAM.

PREPARE A WORK PLAN

The Contractor shall prepare a detailed Work Plan that is responsive to this Work Assignment. Delivery of the Work Plan shall be in accordance with terms of the contract.

VIII. TASKS

The Contractor shall perform the following tasks:

1. Conduct experiments to quantitatively determine the effectiveness (log reduction) of inactivating *B. anthracis* (Ames strain) and *B. subtilis* spores in two different soil types using metam sodium. The soil types to use for testing shall include topsoil and Arizona Road Dust. Tests shall be conducted under the Quality Assurance Project Plan developed under WA 2-1, and consistent with previous tests conducted under WA 2-1. Microbiological procedures, soil coupons and measurement of temperature, relative humidity (RH), decontaminant concentrations, etc. shall be consistent with procedures used under previous projects with EPA. For each microorganism and soil, three new decontamination experiments shall be conducted, with experimental parameters (e.g., quantity of metam sodium, contact time, quantity of water added, aeration time) selected in conjunction with the WAM. Contact time and aeration time may be up to one month or longer. Microbiological analyses of soil coupons from a decontamination experiment that commenced during the previous WA (2-01) shall also be conducted.

2. With technical guidance from the EPA WAM, conduct triplicate tests using standard methods to determine the moisture and organic content of the two test soils that will be used in this WA.

3. Tests shall include a sufficient number of replicates, positive controls, and blanks - consistent with previous projects.

4. Prepare three drafts of a test report (a draft for WAM review and approval; a revised draft for peer and QA review; and a final) be which shall include the test conditions, methods, quality assurance, and results of the tests conducted per the

requirements of this SOW. The report shall also include a brief description of the decontamination technologies tested, in terms of their operational features pertinent to the potential user. The report shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

IX. QUALITY ASSURANCE

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action; see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP shall be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

X. DELIVERABLE SCHEDULE

1. Transfer of project data shall occur via electronic mail at the conclusion of each test. These data shall include, where appropriate, decontaminant levels, temperature, RH, pH, and viable organism counts for test and control coupons.

Task	Estimated Begin date	Estimated Completion Date
1	9/1/12	3/1/13
2	10/1/12	10/15/12
3	9/1/12	3/1/13
4	10/15/12	3/21/13

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-06

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Site Characterization & Monito

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: 3.3.1; 3.1.3;3.1.6;3.1.8 and 3.1.9

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/04/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shal. not duplicate any work completed under any previous WA.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Bill Hagel (Signature) (Date)	Branch/Mail Code: Phone Number: 215-814-3053 FAX Number:
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

Performance Work Statement (PWS)

Technical Support for the Site Characterization and Monitoring Technical Support Center (SCMTSC)

Work Assignment No. 3-6

Period of Performance: CO Issuance – August 31, 2013

Background and Objectives:

The Office of Solid Waste and Emergency Response (OSWER), Regional Superfund Offices, and the Office of Research and Development (ORD) established the Superfund Technical Support Project (TSP) to provide technology-based assistance to EPA's Regional Remedial Project Managers (RPMs) and On-Scene Coordinators (OSCs) through ORD laboratories. The Project consists of a network of Regional Forums and a number of specialized Technical Support Centers (TSC).

The Site Characterization and Monitoring Technical Support Center (SCM-TSC) is managed by the Superfund and Technology Liaison Program (STL) of the Office of Science Policy (OSP.) The SCM-TSC periodically receives requests from regional offices for technical support. After evaluating the request, the Director of the SCM-TSC determines how best to provide that support. This Work Assignment is one of several resources the Director has to fulfilling technical support requests from the regions. The task below is the initial regional request under this work assignment. As additional requests are received the work assignment will be amended to reflect the specific objectives of each request.

General Deliverables:

Deliverables that are associated with this Work Assignment are:

1. Monthly financial status and project progress reports to be submitted to EPA's Contracting Officer Representative (COR) and Work Assignment Manager (WAM) no later than the 10th day of each month while active work is being performed under this Work Assignment, including amendments to this Work Assignment.

2. Prepare technical reports submitted to the WAM for EPA review in the specified timeframe relative to each evaluation or project under the work assignment. These products may be subject to EPA formal peer review procedures if determined by the WAM.

3. Prepare brief summary reports/technical briefs to be submitted to the WAM no later than 10 working days after the conclusion of each evaluation or project.

Task 1 – Identify Laboratories that have the Capability and Availability to Conduct Enzyme Activity Probe Analysis; Provide Cost Estimate and any Draft Agreements for Qualified Laboratories for EPA Review

The contractor shall identify qualified laboratories (including but not limited to any internal laboratory) that have the capability and availability to receive and conduct EAP analysis on up to 10 groundwater samples sent by EPA or state field personnel from groundwater samples taken at the Hopewell Precision Superfund site in Hopewell, NY (EPA Region 2). The contractor shall develop a draft of any necessary agreements with qualified laboratories for the EAP analysis for EPA review. This agreement shall also identify the quality control requirements for the EAP analysis. The contractor shall not enter into an agreement with any laboratory under this work assignment until EPA has reviewed the laboratory qualifications and necessary draft agreements to perform the stated analysis. If, upon completion of the above task, EPA decided to pursue the EPA analysis, an amendment to Work Assignment 3-6 will be issued to authorize that subsequent task.

Delivery Schedule

Delivery	Due Date
Work Plan and Cost Estimate	In accordance with the contract
A list of all identified laboratories that have the capability and availability to conduct EAP, and an estimated cost per unit (per sample or per sample batch) for that analysis.	30 days from approval of work plan and cost estimate
A draft of all necessary agreements, including quality control requirements, to conduct the EAP analysis in a timely manner	30 days from approval of work plan and cost estimate

Quality Assurance

The contractor shall adhere to the Performance Standard(s) in the Quality Assurance Surveillance Plan (QASP) (specific to this Work Assignment) for the Performance Objective(s) that are applicable to the above assignment(s). If additional quality assurance requirements are necessary for a task that are not in the QASP, EPA will identify those requirements in the task description in this document.

If the task requires a Quality Assurance Project Plan, it will be clearly identified in the amendment or technical direction. If necessary, the contractor should prepare the Quality Assurance Project Plan in accordance with *EPA Requirements for Quality Assurance Project Plans (OA/R-5) (EPA/240/B-01/003, 03/20/01)*, available at http://www.epa.gov/quality/qa_docs.html.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-06

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	Base 10/21/2009 To 08/31/2013 Option Period Number 3	Site Characterization & Monito

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: As Original

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/04/2012 To 08/31/2013

Comments:
Work Assignment Amendment 01 shall revise the original WA to add Task 2 per the attached Statement of Work.

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): 22

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 10/21/2009 To 08/31/2013		60
This Action:		56
Total:		116

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Bill Hagel (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 215-814-3053	
	FAX Number:	
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 541-754-4502	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Charles McCormick (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2047	
	FAX Number:	

Performance Work Statement
Work Assignment No. 3-6

Title: Technical Support for the Site Characterization and Monitoring Technical Support Center (SCMTSC)

Period of Performance: September 1, 2012 – August 31, 2013

Background and Objectives:

The Office of Solid Waste and Emergency Response (OSWER), Regional Superfund Offices, and the Office of Research and Development (ORD) established the Superfund Technical Support Project (TSP) to provide technology-based assistance to EPA's Regional Remedial Project Managers (RPMs) and On-Scene Coordinators (OSCs) through ORD laboratories. The Project consists of a network of Regional Forums and a number of specialized Technical Support Centers (TSC).

The Site Characterization and Monitoring Technical Support Center (SCM-TSC) is managed by the Superfund and Technology Liaison Program (STL) of the Office of Science Policy (OSP.) The SCM-TSC periodically receives requests from regional offices for technical support. After evaluating the request, the Director of the SCM-TSC determines how best to provide that support. This Work Assignment is one of several resources the Director has to fulfilling technical support requests from the regions. The task below is the initial regional request under this work assignment. As additional requests are received the work assignment will be amended to reflect the specific objectives of each request.

General Deliverables:

Deliverables that are associated with this Work Assignment are:

1. Monthly financial status and project progress reports to be submitted to EPA's Contracting Officer Representative (COR) and Work Assignment Contracting Officer Representative (WACOR) no later than the 10th day of each month while active work is being performed under this Work Assignment, including amendments to this Work Assignment.

2. Prepare technical reports submitted to the WACOR for EPA review in the specified timeframe relative to each evaluation or project under the work assignment. These products may be subject to EPA formal peer review procedures if determined by the WACOR.

3. Prepare brief summary reports/technical briefs to be submitted to the WACOR no later than 10 working days after the conclusion of each evaluation or project.

Task 1 – Identify Laboratories that have the Capability and Availability to Conduct Enzyme Activity Probe Analysis; Provide Cost Estimate and any Draft Agreements for Qualified Laboratories for EPA Review

The contractor shall identify qualified laboratories (including but not limited to any internal laboratory) that have the capability and availability to receive and conduct EAP analysis on up to 10 groundwater samples sent by EPA or state field personnel from groundwater samples taken at the Hopewell Precision Superfund site in Hopewell, NY (EPA Region 2). The contractor shall develop a draft of any necessary agreements with qualified laboratories for the EAP analysis for EPA review. This agreement shall also identify the quality control requirements for the EAP analysis. The contractor shall not enter into an agreement with any laboratory under this work assignment until EPA has reviewed the laboratory qualifications and necessary draft agreements to perform the stated analysis. If, upon completion of the above task, EPA decided to pursue the EPA analysis, an amendment to Work Assignment 3-6 will be completed to authorize that task.

Delivery Schedule

Delivery	Due Date
Work Plan and Cost Estimate	10 days from the receipt of the Work Assignment
A list of all identified laboratories that have the capability and availability to conduct EAP, and an estimated cost per unit (per sample or per sample batch) for that analysis.	30 days from approval of work plan and cost estimate
A draft of all necessary agreements, including quality control requirements, to conduct the EAP analysis in a timely manner	30 days from approval of work plan and cost estimate

Quality Assurance

The contractor shall adhere to the Performance Standard(s) in the Quality Assurance Surveillance Plan (QASP) (specific to this Work Assignment) for the Performance Objective(s) that are applicable to the above assignment(s). If additional quality assurance requirements are necessary for a task that are not in the QASP, EPA will identify those requirements in the task description in this document.

If the task requires a Quality Assurance Project Plan, it will be clearly identified in the amendment or technical direction. If necessary, the contractor should prepare the Quality Assurance Project Plan in accordance with *EPA Requirements for Quality Assurance Project Plans (OA/R-5) (EPA/240/B-01/003, 03/20/01)*, available at http://www.epa.gov/quality/qa_docs.html.

Task 2: Enzyme Activity Probe (EAP) Analysis for the Hopewell Precision Site, Hopewell, NY

The contractor shall use the WFO generated in Task 1 of WA-06 to secure the services of the Idaho National Laboratory (INL) to receive up to 10 groundwater samples (collected and sent by Region 2), conduct EAP analysis (with all appropriate QA/QC) and generate a report of the data to EPA.

Delivery or Service	Due Date
Work Plan, QAPP and Cost Estimate	5 days from the receipt of the Work Assignment (expedited)
Conduct EAP analysis on the samples received	After receipt (estimated week of March 25, 2013) and in timeframe in accordance with the QAPP.
Generate a data report on the analysis	15 days after samples are analyzed.
Conference call with Region 2	5-15 days after data report is sent to Region 2

Quality Assurance

The contractor shall adhere to the Performance Standard(s) in the Quality Assurance Surveillance Plan (QASP) (specific to this Work Assignment) for the Performance Objective(s) that are applicable to the above assignment(s). A QAPP for the field sampling procedures and the analytical method is required with submittal of the Work Plan.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-08

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Absorp & Desorp of Sulfur Must

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	3.1

Purpose:
- ☒ Work Assignment
- ☐ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/2012. No work shall be performed by the contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Lukas Oudejans (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2973	
	FAX Number:	
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 541-754-4502	
	FAX Number:	
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2852	
	FAX Number: 513-487-2107	
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2029	
	FAX Number: 513-487-2109	

STATEMENT OF WORK
WA 3-08
Contract EP-C-10-001

Absorption and Desorption of Sulfur Mustard on Activated Carbon

OMIS C.2.3.2.02

U.S. Environmental Protection Agency
National Homeland Security Research Center
Decontamination and Consequence Management Division

Table of Contents

I. TITLE

Absorption and Desorption of Sulfur Mustard on Activated Carbon

II. PERIOD OF PERFORMANCE

The period of performance for the contract shall be from September 01, 2012 until August 31, 2013. No costs shall incur against this work assignment prior to September 01, 2012.

III. SUMMARY OF OBJECTIVES

This work shall provide the dynamic adsorption capacity and breakthrough times of chemical warfare agents (CWAs) onto commercially available activated carbon beds. This work is a continuation of previous work assignment (WA) 2-08 under the same contract EP-C-10-001 which was reduced in scope and excluded testing with sulfur mustard (HD).

Currently NHSRC is systematically evaluating volumetric decontamination technologies such as hot (humid) air for the decontamination of CWAs such as Sarin (GB), Soman (GD), VX, and Sulfur Mustard (HD) on interior building materials. Such decontamination method may result in CWA concentrations in the vapor phase at elevated humidity and temperature conditions. This scope of work shall cover the evaluation of activated carbon to capture HD in the presence of elevated humidity and temperature. Because of the presence of water vapor, the possibility of hydrolysis of HD exists which shall be evaluated through identification and semi quantitative analysis of HD degradation products. This work shall also assess desorption characteristics to determine the off-gassing of HD from the activated carbon.

IV. RELEVANCE

The known threat of a chemical agent release in a building or transportation hub is driving US EPA's National Homeland Security Research Center (NHSRC) Decontamination and Consequence Management Division (DCMD) to develop a research program that evaluates potential decontamination strategies. The US EPA may be tasked to cleanup these agents after they are released in buildings. Knowledge on how effective many of the available fumigation technologies are against chemical agents is currently being obtained by DCMD for various volumetric decontamination methods such as (modified) hydrogen peroxide vapor, chlorine dioxide vapor, and hot (humid) air. In the latter case, the decontamination effort may result in (temporarily) elevated CWA vapor concentrations which must be captured before release to the outside environment. It is expected that such capture will occur from air flows at elevated temperatures and humidity, both of which may affect the capability of the sorbent in the air filter system to capture the CWA (or CWA decontamination by-products). In this work, the breakthrough curves of two activated carbon types will be investigated for temperature and relative humidity (RH) conditions related to hot (humid) air decontamination. Results from this study can be used to assess the capability of activated carbon air filters in HVAC applications to capture the CWA under elevated RH and temperature conditions. Hydrolysis of the CWA adsorbed onto the activated carbon in the presence of moisture may occur on the time scale of

the absorption process and the effluent following breakthrough will therefore be analyzed for possible hydrolysis by-products. The measurement of desorption of the CWA from the activated carbon will determine off-gassing characteristics when activated carbon air filters are removed from service.

V. BACKGROUND

Protecting human health and the environment from the release of hazardous materials is the mission of US EPA. NHSRC-DCMD has developed a systematic decontamination research program to fulfill this mission. As part of this program, developmental and commercially available decontamination technologies for chemical agents are being systematically evaluated. Hot air has been assessed for the gaseous decontamination of sarin (GB), VX, sulfur mustard (HD), and soman (GD) as a less complicated and cheaper alternative to e.g. (modified) hydrogen peroxide vapor or chlorine dioxide vapor. It is likely that the effluent during hot air fumigation will contain CWA (by-product) vapors well above the airborne exposure limit which therefore need to be captured before release of the CWA-loaded hot air to the exterior.

VI. SCOPE

The overall objective of this Work Assignment (WA) is to systematically evaluate the dynamic adsorptive capacity of activated carbon beds through measurement of the breakthrough curves as function of temperature and air RH. These parameters shall be determined for the chemical warfare agent Sulfur Mustard (HD); Sarin (GB) was evaluated under WA 2-08. These two agents were selected based on their highly different water solubility as reflected in the Henry's constant K_H, namely 3.4×10^{-5} and 5.7×10^{-7} atm·m^3/mol, respectively (Singer et al.; Environ. Sci. Technol. 2005, 39, 3203-3214). The potential for hydrolysis by-products due to the presence of moisture and activate carbon will also be investigated.

VII. TECHNICAL APPROACH

The details for the overall technical approach can be found in Section VIII. The overall approach is for the contractor to continue to use the method developed under WA 2-08 to measure breakthrough curves of HD on activated carbon beds as function of temperature and RH.

Absorption tests on activated carbon are typically performed with large bed diameters to maximize the amount of carbon in the bed while keeping the pressure drop across the bed as low as possible and to minimize wall effects. Consequently, the adsorbed amount of a chemical onto the activated carbon becomes fairly large which is highly undesirable when working with highly toxic CWAs. Under WAs 1-08 and 2-08 of Contract EP-C-10-001, the contractor designed and tested a system that is capable to deliver CWA to an activated carbon bed with dimensions that closely match the ASTM recommended minimum tube diameter of at least 12 times the diameter of the largest carbon particles present or 16 times the mean diameter [*ASTM Standard Guide for Gas-Phase Adsorption testing of Activated Carbon (D 5160)*].

Under WA 2-08, three activated carbons were evaluated for this study. The following two activated carbons shall be used in this study:

1. IONEX 03-001 (8 x 16 mesh, IONEX Research Corp.)
2. Vapure™ 612 (6 x 12 mesh, Norit Americas, Inc.)

The maximum carbon granule size of 6-mesh is 3.3 mm which allows the use of a 4 cm bed diameter to meet the ASTM recommendation. For a 2.5 cm bed height, this corresponds to 14.3 and 16.0 g bed weights for IONEX 03-001 and Vapure™ 612, respectively, as measured under WA 1-08. The contractor shall measure the bed weights for both carbons if different bed depths are used. A flow velocity of 12 cm/s through the 4 cm diameter bed corresponds to a 9 LPM flow rate which will be the nominal flow rate during this study.

In order to determine the effect that temperature and RH have on the absorption characteristics of CWAs on the activated carbon, the carbon bed must be in equilibrium with T and RH before the CWA is introduced into the air flow at the defined RH and temperature. The time to reach equilibrium with a 55 C and 50% RH air flow condition was determined under WA 1-08 through weight measurements of the absorbed water amount in the activated carbon bed as function of time and was found to be 12 hours for ASZM TEDA and IONEX and 24 hours for Vapure™ 612. Actual values equilibrium values are somewhat lower but are rounded to the nearest (half) day value. These carbon type specific equilibrium times shall be applied to all RH-T combinations in preparation of the CWA absorption test to ensure complete equilibrium.

VIII. TASKS

TASK 1. CONTRACTOR WORK PLAN

A detailed Work Plan is due in accordance with the contract. Content shall be in accordance with terms and conditions of the contract.

TASK 2. UPDATE OF TEST/QA PLAN

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see Attachment #1 and #2. A QAPP entitled "Test Quality Assurance Plan for Absorption and Desorption of Chemical Warfare Agents on (Metal Impregnated) Activated Carbon" was initially approved on January 03, 2011. Version 2 with a modified test matrix was approved on November 10, 2011.

The contractor shall prepare amendments to the existing QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

TASK 3. DEMONSTRATION OF CARBON ABSORPTION/DESORPTION TESTING SYSTEM

The contractor shall adhere to the ASTM Standard Guide for Gas-Phase Adsorption Testing of Activated Carbon, D 5160-95 (ASTM International; West Conshohocken, PA, 2003). Under WA 1-08, a test system for carbon absorption/desorption testing has been developed. This system shall be used by the contractor and shall continue to demonstrate the following features:

- Control of temperature between 25±2 and 55±2 °C
- Ability to deliver (humidified) air (downward) through the carbon bed with RH values up to 60±10% at 55 °C
- Deliver a constant HD (challenge) concentration in air
- Accurate measurement of the 9.0±0.2 LPM flow rate
- Handle activated carbon bed depth of up to 3.5 cm with an inner diameter of 4.0 cm
- Identical preparation of all carbon beds to ensure equal bulk densities per activated carbon type.
- Use of inert materials such as glass or anodized aluminum for the cylindrical tube that holds the carbon bed
- Continuous monitoring of temperature of the (HD loaded) air flow before and after the carbon bed
- RH measurement of air flow (at least) prior to addition of HD and after ending HD supply to air flow during desorption cycle
- Continuous monitoring temperature of carbon bed
- Continuous measurement of pressure drop across the carbon bed.

The feed / challenge concentration level shall be 600 mg/m^3. If the test system is unable to deliver this HD concentration, which equals to a near saturated concentration of HD at room temperature, the contractor shall request technical direction from the EPA WAM on whether to perform the absorption tests at a lower concentration.

Concentrations levels shall be verified at least prior to and after each absorption test. The feed flow rate through each activated carbon bed shall be adjusted such that a flow velocity of 12.0 cm/s is established. This flow velocity is typical for the flow velocity through a large scale activated carbon bed.

The combination of this challenge concentration, flow rate, and use of dry air at 25 °C is expected to result in breakthrough times for the HD agent around 6 hours. The contractor shall request technical direction from the EPA WAM regarding proposed changes to the test conditions if constraints are in place that may prevent the prolonged testing times.

Measurement of HD concentration before and after both carbon beds shall be accomplished using (near) real time monitoring technologies, e.g. available MINICAMS that are set to detect the target CWA. MINICAMS are automatic, near real-time continuous air monitoring systems with high selectivity and sensitivity for various CWAs. They can be operated such that they will notify the user when the effluent exceeds the U.S. Surgeon General's (8-hour) TWA exposure level for the specific CWA

[as per specifications vendor;
http://www.oico.com/default.aspx?id=product&productID=75].

TASK 4. SYSTEMATIC EVALUATION OF CARBON BED BREAKTHROUGH CURVES AND DESORPTION CHARACTERISTICS

This task involves the evaluation of the breakthrough curve and release curve for 3 specific combinations of RH and temperature. The selected RH-T conditions are based on a combination of previously observed hot air decontamination field testing and a dry air, 25 °C, reference condition. The impact of elevated temperature and RH on the absorptive characteristics of the carbon beds will be determined in comparison to the reference condition.

For each air RH-T combination, the carbon bed shall be prepared under the same RH-T condition using the established equilibrium time. Absorption starts at the first introduction of the HD to the activated carbon bed. The effluent shall be monitored continuously for breakthrough of HD. Following the eventual breakthrough, the monitoring of the effluent HD concentration shall continue and be recorded until the effluent concentration has increased by at least a factor 200 above the TWA exposure level for HD. At this point in time, the supply of HD to the activated carbon bed shall end while the RH-T air flow conditions remain the same as during the absorption test. The subsequent desorption of HD from this activated carbon bed shall than be monitored until equilibrium in HD concentration has been reached or until the concentration falls below the detection limit.

Table 1 shows the RH-T combinations that shall be tested for the two types of carbon beds. The contractor shall have a total of 8 absorption tests for the entire test matrix.

Once breakthrough has occurred under (only) the 55 °C / 50% RH condition, part of the effluent from the bed shall be sampled onto e.g. a sorbent tube, for semi quantitative analysis of potential by-products using GCMS. This analysis shall be performed for both activated carbon materials, producing 4 samples for (full scan) GCMS analysis.

Table 1: HD absorption test matrix.

Carbon bed type	Temperature (°C)	RH (%)	Number of replicates
IONEX 03-001	25	dry	2
	55	dry	1
	55	50	1 [a]
Vapure™ 612	25	dry	2
	55	dry	1
	55	50	1 [a]

[a] Following breakthrough, the effluent shall be analyzed semi-quantitative for HD degradation products

TASK 5. COMPLETION OF FINAL REPORT

The contractor shall draft a final report following completing of Task 4. The EPA WAM will coordinate the peer review of the draft report and submit comments to the contractor for their response and products revision. The contractor shall respond to the comments from the peer reviewers and the EPA Quality Assurance officer within 3 weeks of receipt of the comments and no later than August 31, 2013.

IX. DELIVERABLE SCHEDULE

1. On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress, problems encountered, monthly and cumulative financial expenditures, and cost and schedule variance.

2. Bi-weekly conference calls (nominal 30 minutes in length) shall be established between the EPA WAM and the contractor work assignment leader (WAL). During these conference calls the contractor shall report on progress made in the project, discuss any technical issues encountered in implementation of the test plan, and provide the EPA WAM with preliminary results during the execution of the test plan as described in Task 4. Technical directions provided to the contractor by the EPA WAM will be documented in writing to the contractor WAL and will include a copy to the COR of this contract.

3. Transfer of project data (including raw data) shall occur at the conclusion of Task 4. Detailed written summaries of experimental procedures and results shall be provided to the EPA WAM. These reports shall indicate the exact operational conditions (e.g. observed temperatures and relative humidities) and all measured HD breakthrough curves.

4. A draft final technical report shall be submitted within 8 weeks (and no later than August 31, 2013) after the completion of the testing in Task 4 for both carbon beds; thus only 1 draft report shall be submitted under this SOW.

5. A single final technical report shall be submitted that incorporates revisions based on comments from the peer reviewers, quality assurance reviewer and the EPA WAM. The final report is due within 30 calendar days (and no later than August 31, 2013) after receipt of the comments, and shall be in MS Word 2007 format.

X. REPORTING REQUIREMENTS

1. Data and reports generated as a result of this effort shall be shared with the EPA WAM for internal EPA use.

2. Laboratory data shall be transferred electronically to the EPA WAM after the conclusion of each trial or series of tests. Raw data shall be included, specifically all operational conditions, observed relative humidity and temperature values, carbon bed weights and heights etc.

3. Any EPA products (test plans and reports) generated from this contract shall be subject to one internal EPA review and one external review. The EPA WAM will coordinate the peer review of the draft documents and submit combined comments to the contractor for their response and products revision.

4. Products developed under this SOW must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at http://www.epa.gov/nhsrc/guidance.html

5. Prior to submission of the draft report all of the data shall be given to the EPA WAM in electronic format (specifically Microsoft Excel 2007 spreadsheets). The data on these spreadsheets shall be straightforward and explanation of the results via comments shall be added if they are not straightforward.

6. Copies of internal audit reports and responses shall be sent to the EPA WAM in a timely fashion, according to established due dates and no later than August 31, 2013. The WAM and EPA Quality Assurance Manager shall be immediately notified of any critical findings.

7. The contractor shall document all data analysis including statistical models and related assumptions.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Absorption and Desorption of Sulfur Mustard on Activated Carbon
Description:	This work shall provide the dynamic adsorption capacity and breakthrough time of sulfur mustard (HD) onto commercially available activated carbon beds This work is a continuation of previous WA 2-08 under the same contract EP-C-10-001
Project ID:	C.2.3.2.02
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	III
Security Classification:	Unclassified
Project Type:	Applied Research
QAPP Status 1:	Existing QAPP
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-10-001 Work Assignment Number: 3-08 Delivery/Task Order Number: Modification Number: Other:

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes — Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

Adsorption and Desorption of Chemical Warfare Agents on (Metal Impregnated) Activated Carbon, Approved January 03, 2011

Does the QAPP require *any* revision by the contractor**

Amendments will be submitted by the contractor

N/A **Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)**

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles.* ?

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
R2 and R5	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
NHSRC QMP	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Lukas Oudejans NHSRC-DCMD Technical Lead Person	07/17/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	07/18/2012 Date

(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified.

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified, meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified.

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification, as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations (including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING, DATA REDUCTION, AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified (*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be

performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed.

8.3 The responsible party(-ies) for implementing corrective actions shall be identified.

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☒ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the NHSRC's QMP: QAPP requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the NHSRC's QMP QAPP requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

Applied Research Project - pertains to a study performed to generate data to demonstrate the performance of accepted processes

☒ or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

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R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

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Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-08

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Absorp & Desorp of Sulfur Must

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	3.1

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
Work Assignment Amendment 01 shall revise original Statement of Work to modify Task 4 and add new Task 4A1 per the attached Statement of Work.

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name Lukas Oudejans (Signature) (Date)	Branch/Mail Code: Phone Number 919-541-2973 FAX Number:
Project Officer Name Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

AMENDMENT 1
to
STATEMENT OF WORK
WA 3-08

Contract EP-C-10-001

Absorption and Desorption of Sulfur Mustard and Sarin on Activated Carbon

OMIS C.2.3.2.02

U.S. Environmental Protection Agency
National Homeland Security Research Center
Decontamination and Consequence Management Division

Table of Contents

I. AMENDED SCOPE

The overall objective of this work is to systematically evaluate the dynamic adsorptive capacity of activated carbon beds through measurement of the breakthrough curves as function of temperature and air RH.

The impact of these parameters shall now also be determined for the metal impregnated activated carbon ASZM-TEDA at the 12x30 mesh size against HD [modified Task 4]. The same carbon shall also be evaluated on its ability to capture sarin GB [new Task 5]. Previous WA 2-08 evaluated ASZM-TEDA against GB but at a coarser mesh size (6x16 mesh). The finer 12x30 mesh size is identical to sizes used in (military) face mask filters and also in use in larger HVAC type filter systems. Conditions such concentrations, flow rate, carbon bed diameter and carbon bed thickness shall be identical to previously used conditions.

II. MODIFIED TASK 4

Table 1A1 shows the HD adsorption/desorption test matrix. The number of tests in Table 1A1 for the IONEX 03-001 carbon (and exclusion of tests with Vapure™) has been adjusted as per accepted workplan under WA 3-08 (accepted October 10, 2012) prior to this Amendment 1.

Table 1A1: Revised HD absorption test matrix.

Carbon bed type	Temperature (°C)	RH (%)	Number of replicates
IONEX 03-001 (8x16 mesh)	25	dry	1
	55	dry	1
	55	50	1 [a]
ASZM-TEDA (12x30 mesh)	25	dry	1
	55	dry	1
	55	50	1 [a]

[a] Following breakthrough, the effluent shall be analyzed semi-quantitative for HD degradation products

III. NEW TASK 4A1

Table 2A1 shows the GB adsorption/desorption test matrix. Nominal test conditions for this test matrix shall be identical to conditions established under WA 2-08.

Table 2A1: GB absorption test matrix.

Carbon bed type	Temperature (°C)	Agent	RH (%)	Number of replicates
ASZM-TEDA	25	GB	dry	1
(12x30 mesh)	55	GB	dry	1

IV. QUALITY ASSURANCE

For revised Task 4 and new Task 4A1, the contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see Attachment #1 and #2. A QAPP entitled "Test Quality Assurance Plan for Absorption and Desorption of Chemical Warfare Agents on (Metal Impregnated) Activated Carbon" was initially approved on January 03, 2011. Version 2 with a modified test matrix was approved on November 10, 2011.

The contractor shall prepare amendments to the existing QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The draft QAPP amendment will be reviewed by the EPA Contracting Officer Representative (COR) and the EPA Quality Assurance Manager. The contractor shall respond to comments and submit the QAPP approval to the EPA COR and EPA Quality Assurance Manager. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Absorption and Desorption of Sulfur Mustard on Activated Carbon
Description:	This work shall provide the dynamic adsorption capacity and breakthrough time of sulfur mustard (HD) onto commercially available activated carbon beds This work is a continuation of previous WA 2-08 under the same contract EP-C-10-001
Project ID:	C.2.3.2.02
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	III
Security Classification:	Unclassified
Project Type:	Applied Research
QAPP Status 1:	Existing QAPP
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-10-001 Work Assignment Number: 3-08 Delivery/Task Order Number: Modification Number: Other:

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes — Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

Adsorption and Desorption of Chemical Warfare Agents on (Metal Impregnated) Activated Carbon, Approved January 03, 2011

Does the QAPP require *any* revision by the contractor**

Amendments will be submitted by the contractor

N/A Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles.* ?

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
R2 and R5	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
NHSRC QMP	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Lukas Oudejans NHSRC-DCMD Technical Lead Person	07/17/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	07/17/2012 Date

(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified.

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified, meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified.

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification, as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations (including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING, DATA REDUCTION, AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified (*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be

performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed.

8.3 The responsible party(-ies) for implementing corrective actions shall be identified.

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☒ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the NHSRC's QMP: QAPP requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the NHSRC's QMP QAPP requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

Applied Research Project - pertains to a study performed to generate data to demonstrate the performance of accepted processes

☒ or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

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EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-08

☐ Other ☒ Amendment Number: 000002

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013	
	Base X Option Period Number	

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
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- ☐ Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
Work Assignment Amendment 02 shall revise original Statement of Work to add new Task 4A2 per the attached Statement of Work.

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Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Lukas Oudejans (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2973 FAX Number:
Project Officer Name: Reene Watt (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4654 FAX Number: 541-754-4518
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Camille W. Davis (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2095 FAX Number: 513-487-2115

AMENDMENT 2
to
STATEMENT OF WORK
WA 3-8

Contract EP-C-10-001

Absorption and Desorption of Sulfur Mustard and Sarin on Activated Carbon

OMIS C.2.3.2.02

U.S. Environmental Protection Agency
National Homeland Security Research Center
Decontamination and Consequence Management Division

Table of Contents

I. AMENDED SCOPE

The overall objective of this work is to systematically evaluate the dynamic adsorptive capacity of activated carbon beds through measurement of the breakthrough curves as function of temperature and air RH.

The impact of these parameters were determined for the metal impregnated activated carbon ASZM-TEDA at the 12x30 mesh size against sulfur mustard (HD) under the original and Amendment 1 of the statement of work (SOW). Results from this study are not connected at this time to a coarser version (6x16 mesh) of this activated carbon. Such linkage does exist for absorption/desorption of sarin (GB). The single test described in this Amendment 2 will connect the available data to complete this project. Conditions such concentration, flow rate, carbon bed diameter and thickness shall be identical to previously used conditions.

II. AMENDED TASK 4A2

Table 1A2 shows the additional HD adsorption/desorption test condition. Nominal test conditions for this test shall be identical to conditions used under WA 3-08.

Table 1A2: HD absorption test matrix.

Carbon bed type	Temperature (°C)	Agent	RH (%)	Number of replicates
ASZM-TEDA (6x16 mesh)	25	HD	dry	1

III. QUALITY ASSURANCE

For amended Task 4A2, the contractor shall prepare an amendment to the existing QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The draft QAPP amendment will be reviewed by the EPA Contracting Officer Representative (COR) and the EPA Quality Assurance Manager. The contractor shall respond to comments and submit the QAPP approval to the EPA COR and EPA Quality Assurance Manager. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-09

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Eval of Ethylene Oxide

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	3

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/2012. No work shall be performed by the contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 10/21/2009 To 08/31/2013 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Shannon Serre (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3817 FAX Number:
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK

EVALUATION OF ETHYLENE OXIDE FOR THE INACTIVATION OF BACILLUS ANTHRACIS

DCMD C.2.3.1.05

CONTRACT EP-C-10-001

WORK ASSIGNMENT 3-09

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

TABLE OF CONTENTS

I. TITLE

Evaluation of ethylene oxide for the inactivation of *Bacillus anthracis.*

II. PERIOD OF PERFORMANCE

The period of performance for the work under this work assignment shall be 9/1/12 – 8/31/13.

III. SUMMARY OF OBJECTIVES

This work shall determine the efficacy of ethylene oxide for the inactivation of *Bacillus anthracis* (Ba) spores. Another objective is to evaluate the representativeness of *Bacillus atrophaeus* (Bg) as a surrogate for *Bacillus anthracis.* Comparative studies of Bg and Ba are needed to confirm the appropriateness of the use of BG as a surrogate.

IV. RELEVANCE

Fumigation with ethylene oxide (EO) for the decontamination of materials and equipment with anthrax spores has been suggested as an alternative to more harsh fumigants such as chlorine dioxide or hydrogen peroxide. Unlike hydrogen peroxide and chlorine dioxide, ethylene oxide is not an oxidizing agent and kills organisms through alkylation. Information on the efficacy of ethylene oxide on *Ba* has not been determined in a systematic, reproducible way. Future guidance on selection and operation of EO decontamination systems is dependent upon such information.

V. BACKGROUND

Under Homeland Security Presidential Directive (HSPD) 10, the U.S. Department of Homeland Security (DHS) is tasked to coordinate with other appropriate Federal departments and agencies, to develop comprehensive plans which, "provide for seamless, coordinated Federal, state, local, and international responses to a biological attack." As part of these plans, the U.S. Environmental Protection Agency (EPA), in a coordinated effort with DHS, is responsible for "developing strategies, guidelines, and plans for decontamination of persons, equipment, and facilities" to mitigate the risks of contamination following a biological weapons attack.

EPA's National Homeland Security Research Center (NHSRC) provides expertise and products that can be widely used to prevent, prepare for, and recover from public health and environmental emergencies arising from terrorist threats and incidents. NHSRC's Decontamination and Consequence Management Division (DCMD)'s decontamination research program's goal is to provides expertise and guidance on the selection and implementation of decontamination methods and provide the scientific basis for a significant reduction in the time and cost of decontamination events.

Past field experience and recent laboratory investigation have shown the effectiveness of several decontamination technologies for use against anthrax spores and other biological agents. The effectiveness of the technologies varies significantly as a function of operating conditions and challenge conditions (e.g., materials intended to be decontaminated). The use of chlorine dioxide (ClO_2) gas, fumigant hydrogen peroxide (H_2O_2), and methyl bromide has been shown to be effective in the field and laboratory when used in the appropriate circumstances. In addition to efficacy, the development of the remediation strategy also includes consideration of the ability to achieve effective conditions (e.g., fumigant concentration) within the application scenario and the impact of the decontamination process on materials and equipment.

VI. SCOPE

The purpose of this study is to determine the efficacy of ethylene oxide fumigation on *Bacillus anthracis.* A secondary objective is to confirm the appropriateness of the use of Bg as a surrogate for Ba when testing with ethylene oxide.

VII. TECHNICAL APPROACH

The contractor, upon approval from the EPA WAM, shall procure all test equipment and materials to be included in the test sets. The contractor shall conduct pre-screening and documentation of all test equipment and materials prior to exposure to the fumigation conditions in accordance with the approved Quality Assurance Project Plan (QAPP). The contractor shall set-up the experimental system necessary

to complete the fumigation testing. The system shall allow for temperature, RH and ethylene oxide concentration controlled exposures for up to 20 hrs. Additional conditions may be agreed upon after initial work has been completed.

VIII. TECHNICAL RISK

The technical risk involved in this project is minimal. The ultimate goal is to determine the sporicidal conditions for inactivation of Ba spores with ethylene oxide on a variety of materials that would typically be decontaminated with ethylene oxide such as wood, ceramic, plastics, metals, etc. The null and alternative hypotheses are expected to be easily determined and verified.

IX. FACILITIES AND MATERIALS

All experimental efforts shall be performed by the contractor at one of their facilities. All materials and equipment for testing shall be provided by the contractor. The EPA WAM may have some representative materials that could be used in the study.

X. TASKS

The following tasks are defined as part of this work assignment. A Test/QA Project Plan was developed for this work under WA 2-09. This QAPP shall be followed and any amendments shall be submitted to the WA WAM for approval.

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this work assignment (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. The QAPP must be approved prior to the start of any subsequent work. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

Task 1 – Preparation of Work Assignment Work Plan

A detailed Work Plan is due in accordance with the contract. Content shall be in accordance with terms and conditions of the contract.

Task 2 – Experimental System Design and Preparation

The contractor shall prepare and test the experimental chamber that will be used for this testing. The chamber shall be capable of maintaining temperature, relative humidity, and ethylene oxide concentration for up to 20 hour runs. The chamber shall be designed to allow for automated control and measurement for extended time experiments.

Task 3 – Evaluation of Ethylene Oxide for Inactivation of *Bacillus anthracis* and *Bacillus atrophaeus*

Test coupons of porous and non-porous materials that would be decontaminated with EO (e.g., glass, metal, wood, plastic, canvas, paper) shall be prepared in a size consistent with earlier decontamination testing. The list of materials shall be agreed upon based on discussions with the EPA WAM and contractor WAL. Coupons shall be spiked with *B. anthracis* biological agent and *B. atrophaeus*. Associated quality control coupons (positive and negative controls) shall also be prepared. The test coupons shall then be exposed to a given concentration of EO under controlled temperature and relative humidity. After exposure to EO, viable biological agents remaining on the test coupons shall be determined, and decontamination efficacy calculated.

A draft test matrix is shown in Table 1. This matrix will be developed for the Test Plan based on discussions between the EPA WAM and contractor WAL to determine the best approach to satisfy the objectives. A total of 20 runs shall be assumed for developing the work plan estimate.

Adaptive management controls will be used to adjust the test conditions if data suggests different conditions should be used. An addendum to the QAPP shall be added if the Test Plan is changed.

Table 1: Test Matrix for Task 3

Test Number	Ethylene Oxide Exposure Time (hrs)	Treatment Conditions
1	0.75	Ethylene Oxide Fumigation: EtO concentration=150 mg/l for 45 min T=122 F, RH=50%
2	1.5	Ethylene Oxide Fumigation: EtO concentration=150 mg/l for 90 min T=122 F, RH=50%
3	12	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.
4	4	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.
5	8	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.
6	12	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.
7	TBD	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.
8	TBD	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.
9	TBD	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.
10	TBD	Ethylene Oxide Fumigation: RH and EtO concentration to be determined. T=122 F.

TBD=To be determined
Total number for estimate=20 runs

Task 4 – Reporting

All data collected per the QAPP shall be submitted to the EPA WAM within two weeks after the completion of the test matrix. The contractor shall submit a draft report on the compilation of results from the efficacy testing and material and equipment compatibility testing within 6 weeks from conclusion of tests. Compilation and analysis of testing data shall begin as soon as testing begins under Task 3, and data from all runs shall be compiled into an electronic format. Upon completion, compiled test data shall be provided to the EPA WAM in Microsoft Excel format. A summary report which covers the test conditions, methods, quality assurance, and results of evaluating EtO decontamination shall be prepared. The report would conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). A draft of the report shall be provided for review and approval. The EPA WAM will obtain peer review and QA comments and will submit them to the contractor to revise the report. Upon receipt of review comments, the report shall be revised and a final version of the report shall be provided to EPA within 4 weeks after receiving comments and no later than August 31, 2013.

It is anticipated the contractor WAL shall have ongoing technical communication with the EPA WAM on a bi-weekly basis where results to date can be discussed.

XI. DELIVERABLE SCHEDULE

- On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress (including estimated percent of project completed), problems encountered, quarterly and cumulative financial expenditures and cost and schedule variance.

- A draft report shall be delivered to the EPA WAM by 05/31/2013.

Table 1: Deliverable Schedule

Deliverable	Date
Work Plan	In accordance with the contract
Data summaries	On-going, no later than 8/31/13
Draft Report	5/31/13
Final Report	7/31/13

XII. REPORTING REQUIREMENTS

- The Contractor shall prepare Quality Control data reports of all facility-specific data. Each Quality Control report shall be in a format suitable for EPA/NHSRC publication and shall discuss how well various measurements described in the QA plan were met.
- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.
- After consultation with the EPA WAM, the contractor may submit draft journal papers suitable for publication for each task, in lieu of a final technical report. The papers may be authored or co-authored by the EPA WAM, and will be decided on a individual basis in consultation with the WAM. To serve in lieu of the final report, the journal articles must contain all of the relevant information that would have appeared in the final report.
- All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-11

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013	Testing & Eval Army Tox Sensor
	Base Option Period Number 3	

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: 3

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/2012. No work shall be performed by the contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Shannon Serre (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3817 FAX Number:
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK

TESTING AND EVALUATION OF ARMY TOXICITY SENSORS

CONTRACT EP-C-10-001

WORK ASSIGHMENT 3-11

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER

TABLE OF CONTENTS

I. TITLE

Testing and Evaluation of Army Toxicity Sensors.

II. PERIOD OF PERFORMANCE

The period of performance for the work under this work assignment shall be Award – 8/31/13.

III. SUMMARY OF OBJECTIVES

The purpose of this work assignment is to apply EPA Technology Testing and Evaluation Program (TTEP) procedures previously used for evaluating rapid toxicity technologies to two US Army toxicity sensors in order to provide an independent determination of the sensor performance characteristics.

IV. BACKGROUND

The US EPA through an interagency agreement with the US Army Center for Environmental Health Research (USACEHR) will be evaluating two rapid toxicity sensors for testing Army field drinking water supplies as part of its Environmental Sentinel Biomonitoring (ESB) program: an Electric Cell-Substrate Impedance Sensing (ECIS) device developed by Biosentinel, Inc. and an enzyme inhibition-based device developed by ANP Technologies, Inc. In order for these toxicity sensors to proceed to advanced development and fielding for use by Army Preventive Medicine personnel, they must meet a number of performance criteria developed by an Integrated Product Team (IPT) of Army users. The most important requirement, known as the Key Performance Parameter (KPP), is "EPA Compliance under the Environmental Technology Verification (ETV) Program and the Technology Testing and Evaluation Program (TTEP)". This research effort will evaluate the Army toxicity sensors using TTEP procedures to demonstrate their performance characteristics. TTEP offers an independent evaluation of these sensors.

V. SCOPE and TECHNICAL APPROACH

The US EPA, through contract EP-C-10-001, will conduct testing that follows established practices used previously for both ETV and TTEP testing of rapid toxicity technologies that were conducted by Battelle (2003). The test plan will have modifications (identified in this SOW) to allow the specific toxic chemicals and interferants of concern to the US Army IPT (and their concentration levels of concern) to be evaluated. The sensors will be provided by the US Army. Additional training on the use of the sensors will also be provided by the US Army or the sensor developer.

1. Use the previously developed test plan (Battelle, 2003) to test both the Biosentinel and ANP Technologies toxicity sensors. These sensors will be provided by the US Army to Battelle.

2. Modify the former test plan to meet Army requirements as follows:

   a. Dilution water used for all testing shall be ASTM Type II deionized (DI) water, consistent with Army field drinking water that is produced using reverse osmosis-based purification equipment. (Alternatively, water generated from an Army field water production unit may be used, if available.) Tap water samples shall not be tested.

   b. Utilize 18 toxicants and 6 interferants identified by the US Army (see Table 1 and 2). The toxicants and interferants referenced in the Test/QA plan (Battelle, 2003) shall not be used. Some samples may require pH adjustment before testing. When analytical methods are available, the concentration of each toxicant stock solution shall be confirmed.

   c. Estimate lethal levels for 15 Army toxicants using Battelle (2003) methods; lethal levels for aldicarb, cyanide, and thallium are in Battelle (2003). Consistent with US EPA test procedures, use these levels as the starting concentrations for toxicity sensor testing.

   d. When conducting dilution series testing of toxicants, include the Army-estimated human lethal concentration (HLC) and military exposure guideline (MEG) concentrations for each chemical as reference points.

   e. Four replicates shall be tested at each concentration of toxicant or interferant.

f. If any of the interferants cause a response at the initial concentration tested, analysis of three ten-fold dilutions shall be performed to estimate the threshold response level. For chlorine and chloramine, demonstrate whether the use of a reducing agent (sodium bisulfite) will eliminate the response.

Table 1 List of Contaminants to be tested.

Test Chemical	Chemical Abstract Service Number	MEG[1]	HLC[2]
Acrylonitrile	107-13-1	0.47	4.2
Aldicarb	116-06-3	0.0047	0.17
Ammonia	7664-41-7	30[3]	924
Arsenic (sodium arsenite)	7784-46-5	0.02	4.5
Azide (sodium azide)	26628-22-8	0.12	47
Copper (sulfate)	7758-98-7	0.047	103
Cyanide (sodium)	143-33-9	2.0	14
Fenamiphos	22224-92-6	0.0042	0.56
Fluoroacetate (sodium)	62-74-8	0.00072	5.1
Mercury (chloride)	7487-94-7	0.01	24.7
Methamidophos	10265-92-6	0.00023	1.4
Methyl parathion	298-00-0	0.14	33.6
Nicotine	54-11-5	0.13[3]	16.8
Paraquat (dichloride)	1910-42-5	0.034	4.6
Pentachlorophenate (sodium)	131-52-2	0.14	71.9
Phenol	108-95-2	2.8	91.5
Thallium (sulfate)	7446-18-6	0.0033	13.5
Toluene	108-88-3	9.3	840

[1] Military Exposure Guideline (MEG) for 15L/day consumption, 14-day exposure (USAPHC, 2010, Appendix D)
[2] Estimated Human Lethal Concentration (HLC) (70 kg person, 15L/day)
[3] No MEG listed in USAPHC (2010); MEG obtained from USACHPPM (2004).

Table 2 List of Interferants to be tested.

Potential Interference	Concentration (mg/L)
Chlorine	10
Chloramines	10
Geosmin	0.0001
Methyl-isoborneol (MIB)	0.0001
Humic / Fulvic Acids	5 (2.5/2.5)
Hard Water (as $CaCO_3$)	250

VI. TECHNICAL APPROACH

The contractor, upon approval from the EPA WACOR, shall procure all test equipment and materials to be included in the test matrix. The contractor shall set-up the experimental system necessary to complete the sensor testing.

VII. FACILITIES AND MATERIALS

All experimental efforts shall be performed by the contractor at one of their facilities. All materials and equipment for testing shall be provided by the contractor, with the exception of the sensors as these will be provided by the US Army. Three units of each of the toxicity sensor technologies being tested have been provided by the US Army. Three units are required to increase sample throughput.

VIII. TASKS

A test/quality assurance plan has already been developed for this project. Any additional work will need to be added by submitting an addendum to the EPA WACOR. The addendum shall be approved by the EPA WACOR prior to initiating the work. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this work assignment (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

The following tasks are defined as part of this work assignment:

Task 1 – Preparation of Work Assignment Work Plan

A detailed Work Plan is due 20 calendar days after receipt of the approved Work Assignment. Content shall be in accordance with terms and conditions of the contract.

Task 2 – Completion of Technology Testing

The contractor shall follow the procedures described in the test/QA plan including the performance of a technical systems audit (TSA) and performance evaluation (PE) audit during the execution of the testing phase. As necessary, the contractor shall operate the equipment/technology being tested according to the procedures (i.e., standard operating procedures, method, instructions, etc.) provided by the sensor manufacturers and included in the test/QA plan.

Task 3 – Data Evaluation and Reporting

The contractor shall compile, validate/verify, analyze, and reconcile the data. The contractor QA Manager shall audit at least 10% of the evaluation data acquired in the evaluation test. The contractor QA Manager shall trace the data from initial acquisition, through reduction and statistical comparisons, to final reporting. All calculations performed on the data undergoing the audit shall be checked.

The report shall be submitted to the EPA WACOR in Microsoft Word and Adobe Portable Document (pdf) format. The evaluation report shall be subjected to technical and QA review by the participating vendors, contractor staff, EPA, US Army, and expert peer reviewers. Any limitations to the data shall be addressed and discussed in the evaluation report(s). The reviews shall assure that this evaluation and the resulting reports meet the needs of potential users of the evaluated technologies. Based on feedback from the reviewers, the evaluation report shall be finalized. Products developed under this SOW must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Significant portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

The final report, in the standard TTEP reporting format, shall be generated on the testing and evaluation of the two sensors with the following:

i. Endpoint response for all concentration levels, contaminants and potential interfering compounds tested during the effort;

ii. Precision;

iii. False negative rate (frequency of inhibition similar to the negative control reported when a contaminant is present at the EPA-defined lethal concentration level) ;

iv. False positive rate (frequency of detectable inhibition reported in un-spiked water samples);

v. Field portability;

vi. Ease of use; and

vii. Throughput.

b. The report shall state the total number of chemicals to which either of the toxicity sensors responded between the Army MEG and HLC levels.

It is anticipated the contractor WAL shall have ongoing communication with the EPA WACOR on a bi-weekly basis where results to date can be discussed.

Task 4 – Follow-up Toxicity Sensor Testing (post – evaluation)
Following review of the report, additional tests may be identified that need to be performed. Based on discussions with the EPA WACOR, additional tests may be identified and agreed upon. An addendum to the QAPP shall be prepared and approved prior to the initiation of any additional tests. Recommendations for additional tests may also be identified for future testing as part of Task 3.

IX. DELIVERABLE SCHEDULE

- On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress (including estimated percent of project completed), problems encountered, quarterly and cumulative financial expenditures and cost and schedule variance.

- A draft report shall be delivered to the EPA WACOR within 6 weeks after the completion of testing and no later than June 30, 2013.

Table 1: Deliverable Schedule

Deliverable	Date
Work Plan	20 days after receipt of work assignment
Data summaries	On-going
Draft Report	Within 6 weeks of completion of testing
Final Report	4 weeks after receiving comments

X. COMMUNICATION

It is expected that monthly calls will be held between the EPA WACOR, US Army and the contractor. The contractor will provide progress updates/reports as appropriate (at least monthly to support invoicing) and invoices monthly for work completed.
The contractor shall submit monthly progress reports which shall contain, at a minimum, the progress on each task, the costs to date, the reason for any deviations from the project schedule, and a planned expenditure rate for the entire project.

XI. REPORTING REQUIREMENTS

- The Contractor shall prepare Quality Control data reports of all facility-specific data. Each Quality Control report shall be in a format suitable for EPA/NHSRC publication and shall discuss how well various measurements described in the QA plan were met.
- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.
- In lieu of a final technical report, journal papers within each task may be submitted at the discretion of the EPA WACOR. The papers shall be authored or co-authored by the EPA WACOR, at the discretion of the WACOR. To serve in lieu of the final report, the journal articles should contain all of the relevant information that would have appeared in the final report.
- All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

XII. REFERENCES

Battelle. 2003. Test/QA Plan - Verification of Rapid Toxicity Technologies. Battelle, Columbus, OH.

U.S. Army Center for Health Promotion and Preventive Medicine. 2004. Chemical Exposure Guidelines for Deployed Military Personnel. Technical Guide 230. US Army Center for Health Promotion and Preventive Medicine, Aberdeen Proving Ground, MD.

US Army Public Health Command. 2010. Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel. Technical Guide 230, June 2010 Revision. US Army Public Health Command (Provisional), Aberdeen Proving Ground, MD.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Deposition Method Development

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: 3.1

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/2012. No work shall be performed by the contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: John Drake (Signature) (Date)	Branch/Mail Code: Phone Number: 513-235-4273 FAX Number:
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

7/7/2016
John Drake

STATEMENT OF WORK

Work Assignment 3-14

DEPOSITION METHOD DEVELOPMENT AND DEMONSTRATION OF DECONTAMINATION PROCESSES FOR OF REMOVAL OF RADIONUCLIDES ON URBAN MATERIALS

Estimated Hours for this Requirement: TBD hours

I. PERIOD OF PERFORMANCE

The period of performance for this Work Assignment (WA) shall be from September 1, 2012 through August 31, 2013.

II. PURPOSE

This work shall evaluate the decontamination efficacy of two chemical-based commercial decontamination technologies for removal of Americium from porous surfaces.

The technology evaluation shall build on previous research and evaluation projects conducted by NHSRC. These projects include similar evaluations accomplished under the EPA's Technology Testing and Evaluation Program (TTEP), which has developed test methods, protocols, Quality Assurance Project Plans (QAPP), and facilities. The approved QAPP previously developed under WA 2-14 shall be used to guide this evaluation. Previous work executed under WA 2-14 devised test methods and materials, and performed similar decontamination tests involving Strontium-85 and Cobalt-60. This WA performs these same tests using Americium-243, on the same porous substrates, concrete, and granite.

The Contractor shall (1) propose a Work Plan sufficient to execute the decontamination evaluation, including data analysis and reporting, (2) participate in the laboratory activities required to execute the decontamination test and (3) analyze the resulting data, including evaluation of parameters related to deployment of the technology in an operational setting, and provide a draft report.

The technology performance evaluations shall result in the determination of a "decontamination factor" (the amount of any remaining contamination following application of the decontamination technology, relative to the initial amount of contamination).

III. BACKGROUND

The U.S. Environmental Protection Agency (EPA) has the responsibility for protecting human health and the environment from accidental and intentional releases of radiological materials. The National Response Framework (NRF), Nuclear/Radiological Annex designates EPA as a supporting agency for the long term recovery phase of a response. The EPA Office of Research and Development (ORD) National Homeland Security Research Center's (NHSRC) Decontamination and Consequence Management Division (DCMD) is conducting technology evaluations for the decontamination of urban materials. The demonstrations and the evaluations or results are based on test conditions prescribed in a Quality Assurance Project Plan (QAPP)

agreed upon between the Contractor and the EPA Work Assignment Contracting Officer's Representative (WACOR). The results of the demonstrations shall generate data that can be used to support decisions concerning the selection and use of decontamination technologies for urban materials contaminated with specific radiological threat agents. The results of the work will be made available to the homeland security community through published reports, journal papers, information systems and conference presentations/proceedings. The information may also be used in clean up guidance pertaining to specific threat agents and release scenarios.

IV. TECHNICAL APPROACH

The decontamination evaluation shall utilize the method(s) and materials for deposition and measurement of radioactive contamination using Americium-243 that were developed under WA 2-14 and described in "Quality Assurance Project Plan for Evaluation of Chemical Technologies for Decontamination of Cobalt, Strontium, and Americium from Porous Surfaces, May 8, 2012, USEPA/NHSRC" (Ref A). The Contractor shall maintain this QAPP and provide revisions if and as necessary.

Using data provided by EPA resulting from execution of the approved QAPP, the Contractor shall evaluate the efficacy of the selected decontamination technologies, based on analysis of the decontamination factor (DF) achieved. The Contractor shall also qualitatively evaluate the difficulty of using the technologies under realistic conditions, any resultant surface damage, and the quantity of waste generated. The data required for these evaluations will be provided to Battelle by EPA from the results of laboratory experiments executed by the Idaho National Laboratory (INL) under the direction of EPA.

V. TASKS

The work that shall be performed is organized into three separate tasks. Task 1 shall propose the Work Plan for execution of the tests and analysis and reporting of results. Task 2 shall execute the Contractor's participation in the evaluation as described in the QAPP. The evaluation shall be based on data resulting from execution of the QAPP, which data will be provided by EPA. Task 3 shall include analysis of data generated in Task 2 and preparation of a summary report documenting the results of the data analysis and experimental work completed, including a description of the test conditions and all data. The report shall include and build on the draft report initiated under WA 2-14.

TASK 1: PREPARATION OF WORK PLAN

The Contractor shall develop a detailed Work Plan for execution of the tests and analysis and reporting of results. Content shall be in accordance with terms and conditions of the contract.

TASK 2: TECHNOLOGY EVALUATION - EXECUTION

This task shall evaluate all data provided by EPA as a result of execution of the QAPP. The Contractor shall determine the decontamination factors (DF) achieved by application of the selected decontamination technologies. The radiological laboratory

activities will be performed by INL under the direction of EPA. The Contractor shall participate in the laboratory activities to the extent required to assure successful completion of the evaluation, including, but not limited to, recording of data and providing technical support as needed to the EPA test director during the execution of the test.

The Contractor shall maintain the QAPP developed in WA 2-14 and provide revisions if and as necessary. The Contractor shall ensure that the QAPP meets all QA requirements in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf based on the type of research that is being conducted. The Contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this contract package (see Attachment #1 to the SOW) and the NHSRC QA requirements as defined in Attachment #2 to the SOW and in NHSRC's QMP. The QAPP, including any amendments, must be approved by the U.S. EPA in writing (e.g., signature on the approval page) prior to the start of Task 2. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

TASK 3: DATA ANALYSIS AND SUMMARY REPORT

The Contractor shall perform data analysis to determine decontamination factors for the selected contaminant and substrates and provide a technical report which shall document the results of Task 2, including all data generated. The report shall include and build on the draft report initiated under WA 2-14.

VI. DELIVERABLE SCHEDULE

Task 1: A detailed Work Plan shall be submitted in accordance with the terms and conditions of the contract.

Task 2: Shall begin after the EPA WACOR has reviewed and approved any required revisions to the QAPP.

Task 3: A single draft technical report documenting the results of Task 2 shall be submitted to the WACOR no later than 2 months after completion of Task 2. The WACOR will review the draft report and provide comments to the Contractor within 30 days of receipt. The final technical report will be accepted by the WACOR after the Contractor has resolved all comments.

VII. REPORTING REQUIREMENTS

- All products, e.g. technical reports, generated under this WA shall be peer reviewed by at least one external (non-NHSRC) and at least one internal (NHSRC) reviewer. The WACOR will coordinate the peer review of the draft documents and submit comments to the Contractor for product revision and comment response.

- All data shall be transferred to the EPA WACOR in electronic format, in MS Excel worksheets, before the submission of the draft summary report. The worksheets shall be adequately commented to ensure that the data presented is clearly identifiable.
- On a monthly basis for the duration of the project, the Contractor shall submit, in electronic format, status reports summarizing technical progress (including estimated percent of project completed), problems encountered, monthly and cumulative financial expenditures, and cost and schedule variance.
- Transfer of project data shall occur at the conclusion of the testing. This data includes reports of the conditions (e.g., concentrations, temperature, relative humidity, etc.) and all measured variables (e.g., contamination levels).
- All products developed under this SOW (e.g. the above mentioned technical report) shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Impact of CBR Contaminated Sed

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	Section 2, para 1, item 3

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/2012. No work shall be performed by the contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
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Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
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Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name Scott Minamyer (Signature) (Date)	Branch/Mail Code: Phone Number 513-569-7175 FAX Number: 513-487-2555
Project Officer Name Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK

Impact of CBR Contaminated Sediments on Flushing and Decontamination of Drinking Water Storage Facilities

Contract Number EP-C-10-001
WA 3-15

I. TITLE

Impact of CBR Contaminated Sediments on Flushing and Decontamination of Drinking Water Storage Facilities

II. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from Work Assignment approval until August 31, 2013.

III. BACKGROUND

The EPA's National Homeland Security Research Center (NHSRC) conducts research to protect, detect, respond to, and recover from terrorist attacks on the nation's water and wastewater infrastructure. Among concerns of such attacks is the adsorption of chemical, biological, or radiological (CBR) contaminants to sediments in drinking water storage tanks and reservoirs. Sediments can serve as sinks for contaminants and adhesion to sediment particles following the introduction of CBR agents must be taken into account when developing treatment and decontamination strategies. Research is needed to better understand the adherence and persistence of selected contaminants on storage facility sediments and methods for flushing and decontamination.

Water storage facilities are used to store water from wells or water treatment facilities at times when demands for water are low for use during periods of high demand. Storage facilities may consist of large reservoirs behind dams (impoundments) or service storage reservoirs located at water treatment plants or at various places in distribution systems. Operational service storage tanks in distribution systems may include clear wells, pressure tanks, elevated tanks, ground-level tanks or reservoirs, or underground facilities.

The accumulation of sediments in storage facilities can be problematic even under normal operating conditions, especially if tanks and reservoirs are not routinely inspected and maintained. Over time, there is a potential for a significant volume of sediment to accumulate. Typical water quality problems may include loss of chlorine residual and growth of bacteria. Chemical water problems may be caused by leaching of chemicals from tank linings or coatings. Leaching of chemicals could cause taste and odor problems, and the quantity of disinfection by-products in the treated water could increase during storage. Common causes of physical water quality problems include settling and collection of sediment, rust, and chemical precipitates.

IV. OBJECTIVE

The objective of this work assignment is to increase the scientific understanding of the effects of contaminated sediments on continued operations of drinking water storage facilities following the introduction of chemical, biological, or radiological agents and impacts on decontamination or flushing strategies. Additional knowledge in this area will be useful to water utilities and other decision-makers in assessing impacts of an event and selecting effective methods for handling contaminated sediments and decontaminating the storage facilities.

V. SCOPE

This study involves obtaining sediments from actual water tanks at various locations and investigating the adsorption of selected contaminants (with a range of adsorptive properties) onto the sediments. Storage tanks are expected to have a lot of sediment in them, which could impact flushing strategies following a contamination incident, particularly if contaminants have adsorbed to the sediment. If significant adsorption occurs, utilities will need to take it into account when developing a flushing or decontamination plan. The study will examine the adsorption potential of target CBR contaminants to various sediment constituents, investigate how sediments may affect the flushing of contaminated tanks and other distribution system infrastructure, and identify any general properties that can be applied across various types of sediments to assist with development of flushing or decontamination strategies. Potential contaminants to be studied include cesium, cobalt, strontium, Bacillus spores, potassium cyanide, chlordane, and other chemicals that span a range of adsorptive mechanisms and values (i.e., ion exchange or different hydrophobicity levels).

VI. TASKS

The Contractor shall perform the following tasks:

Task 1. Prepare Work Plan

A detailed Work Plan is due in accordance with the contract. Content shall be in accordance with terms and conditions of the contract.

Task 2. Prepare Quality Assurance Project Plan

Within 30 calendar days following approval of the Work Plan, and with technical direction from the EPA Work Assignment Manager (WAM) when necessary, the Contractor shall develop data quality objectives, which in turn shall serve as the basis for the quality assurance plan. The Contractor shall prepare a Quality Assurance Project Plan (QAPP) that complies with all requirements delineated under "Quality Assurance" below. The QAPP shall be based on the final QAPP approved for WA 2-15.

Task 3. Collect Sediment Samples from Several Utility Drinking Water Storage Facilities

Within 120 calendar days following work plan approval, the Contractor shall collect sediment samples from utility storage facilities at up to ten different locations approved by the EPA WAM. Sediments may be obtained from storage tanks, reservoirs, clear wells, or other sediment sources approved by the EPA WAM via technical direction.

Task 4. Perform Analysis of Sediment Samples

Within 60 calendar days following the collection of sediment samples under Task 3, or as otherwise approved by the EPA WAM, the Contractor shall analyze the sediment samples as prescribed in the approved QAPP and report results to the EPA WAM. Sediment analysis results shall be included in the final study report submitted to the EPA WAM upon completion of the work assignment.

Task 5. Determine Adherence of Target Contaminants to Sediments

Within 60 calendar days following the collection of sediment samples under Task 3, or as otherwise approved by technical direction from the EPA WAM, the Contractor shall determine the concentration of introduced target contaminants adhering to sediments versus the concentration remaining in the bulk water. As part of this task, the Contractor shall develop a model for predicting the adhesion of contaminants, based on measurable sediment properties and contaminant properties. The predictive model shall be useful for enabling decision makers to take meaningful courses of action related to the adhesion propensity of sediment/contaminant combinations for which experimental data is not available.

Task 6. Analyses of Additional Solids Samples

As indicated by EPA WAM technical direction over the course of the option year, forty (40) solids samples provided by EPA (pipe sections, storage tank sediment or hydrant flushed samples) shall be analyzed for elemental (Mg, Al, Si, P, Ca, V, Fe, Mn, Ni, Cu, Zn, As, Cd, Sb, Ba, Pb, U, Na,Tl) analysis according to the procedures described in the QAPP (i.e., digestion/ICP-MS analysis). EPA will provide samples in groups of at least 10 samples at a time in prepared/powder form.

In addition, six (6) communities will be identified to provide four solids samples to be analyzed as noted above and one set of general water chemistry analysis. EPA will arrange for community participation and shipping of pipe samples, sediment and hydrant flush samples for the samples, although suggestions from the contractor could also be considered. Of the six sites, the solids and waters of two (2) identified or approved by the EPA WAM shall also include radioisotope analysis (Gross Alpha, Gross Beta, RA-226, RA-228, Th-228, Th-230, Th-232, U-234, U-235,U-236, U-238). Samples will be shipped directly to the contractor.

Also, the distribution system of one (1) community shall be monitored by the contractor monthly over a 10 month period. Four water quality samples (one sample from the distribution system entry point and three samples in the distribution system) shall be analyzed for general water

chemistry and radioisotope analysis. Over the course of the time, eight solids samples shall be analyzed for elemental and radioisotope analysis as describe above. EPA will coordinate sampling events, provide appropriate sample bottles and shipping (arrange for site to send samples directly to contractor).

The emphasis of these analyses will be to understand the distribution of trace contaminants that accumulate in drinking water distribution systems.

Task 7. Develop Study Report

Within 30 calendar days following completion of Task 5, the Contractor shall develop a draft study report, in Microsoft Word, and deliver the draft to the EPA WAM for review. EPA will review the draft and provide any comments and changes within 15 days. The Contractor shall incorporate any changes and deliver a final report within 15 calendar days following receipt of EPA comments. The Contractor shall also deliver all experimental data to the EPA WAM in electronic format along with the final report.

DELIVERABLE SCHEDULE

Task 1. Work Plan in accordance with the contract.

Task 2. QAPP within 30 calendar days following approval of the Work Plan.

Task 3. Sediment Samples collected from several utility drinking water storage facilities within 120 calendar days following Work Plan approval.

Task 4. Results of sediment sample analysis within 60 calendar days following the collection of sediment samples under Task 3, or as otherwise approved by the EPA WAM.

Task 5. Study performed to determine adherence of target contaminants to sediments within 60 calendar days following the collection of sediment samples under Task 3, or as otherwise approved by the EPA WAM.

Task 6. Data shall be provided to the EPA WAM in the form of digital images of samples as received and worksheets within two weeks of the completion of each batch of samples analyzed.

Task 7. Draft study report within 30 calendar days following completion of Task 5 and final report within 15 calendar days following EPA WAM approval of the draft report.

VII. REPORTING REQUIREMENTS

On a monthly basis for the duration of the project, the Contractor shall submit in electronic format a status report summarizing technical progress, problems encountered, and budget expended to date in accordance with the terms of the contract.

VIII. QUALITY ASSURANCE

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

VIV: TECHNICAL DIRECTION

All official technical direction provided by the EPA WAM will be provided in writing as necessary.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Impact of CBR Contaminated Sed

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	Section 2, para 1, item 3

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

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SFO (*Max 2*) ☐

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5										

Authorized Work Assignment Ceiling

Contract Period: 10/21/2009 To 08/31/2013 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name Scott Minamyer (Signature) (Date)	Branch/Mail Code:	
	Phone Number	513-569-7175
	FAX Number:	513-487-2555
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STATEMENT OF WORK

Impact of CBR Contaminated Sediments on Flushing and Decontamination of Drinking Water Storage Facilities

Contract Number EP-C-10-001
WA 3-15

I. TITLE

Impact of CBR Contaminated Sediments on Flushing and Decontamination of Drinking Water Storage Facilities

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The objective of this work assignment is to increase the scientific understanding of the effects of contaminated sediments on continued operations of drinking water storage facilities following the introduction of chemical, biological, or radiological agents and impacts on decontamination or flushing strategies. Additional knowledge in this area will be useful to water utilities and other decision-makers in assessing impacts of an event and selecting effective methods for handling contaminated sediments and decontaminating the storage facilities.

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A detailed Work Plan is due in accordance with the contract. Content shall be in accordance with terms and conditions of the contract.

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The emphasis of these analyses will be to understand the distribution of trace contaminants that accumulate in drinking water distribution systems.

Task 7. Develop Study Report

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DELIVERABLE SCHEDULE

Task 1. Work Plan in accordance with the contract.

Task 2. QAPP within 30 calendar days following approval of the Work Plan.

Task 3. Sediment Samples collected from several utility drinking water storage facilities within 120 calendar days following Work Plan approval.

Task 4. Results of sediment sample analysis within 60 calendar days following the collection of sediment samples under Task 3, or as otherwise approved by the EPA WAM.

Task 5. Study performed to determine adherence of target contaminants to sediments within 60 calendar days following the collection of sediment samples under Task 3, or as otherwise approved by the EPA WAM.

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VII. REPORTING REQUIREMENTS

On a monthly basis for the duration of the project, the Contractor shall submit in electronic format a status report summarizing technical progress, problems encountered, and budget expended to date in accordance with the terms of the contract.

VIII. QUALITY ASSURANCE

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

VIV: TECHNICAL DIRECTION

All official technical direction provided by the EPA WAM will be provided in writing as necessary.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-16

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Evaluation of Methyl Iodide

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Section 3

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 10/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III (09/01/2012 - 08/31/2013). The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA shall be the date issued by the Contracting Officer. No work shall be performed by the contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Shannon Serre (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-3817	
	FAX Number:	
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 541-754-4502	
	FAX Number:	
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2852	
	FAX Number: 513-487-2107	
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2029	
	FAX Number: 513-487-2109	

STATEMENT OF WORK

EVALUATION OF METHYL IODIDE FOR THE INACTIVATION OF BACILLUS ANTHRACIS

DCMD C.2.2.1.3
WORK ASSIGNMENT 3-16

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

TABLE OF CONTENTS

I. TITLE

Evaluation of methyl iodide for the inactivation of *Bacillus anthracis.*

II. PERIOD OF PERFORMANCE

The period of performance for the work under this work assignment shall be Issuance – 8/31/13.

III. SUMMARY OF OBJECTIVES

This work shall determine the efficacy of methyl iodide (MeI) for the inactivation of *Bacillus anthracis* (*Ba*) spores. Another objective is to evaluate the representativeness of *Bacillus atrophaeus* (*Bg*) as a surrogate for *Bacillus anthracis.* Comparative studies of *Bg* and *Ba* are needed to confirm the appropriateness of the use of *Bg* as a surrogate.

Future direction may involve the testing of hydrogen phosphide (phosphine, PH3) for the inactivation of *Ba.* A work assignment amendment will be submitted if this direction is chosen.

IV. RELEVANCE

Fumigation with methyl iodide (MeI) for the decontamination of materials and equipment with anthrax spores has been suggested as an alternative to the use of methyl bromide (MeBr), a known ozone depleting chemical. MeI is currently being used as a soil fumigant in the US and other countries. Information on the efficacy of methyl iodide on *Ba* has not been determined in a systematic, reproducible way.

V. BACKGROUND

Under Homeland Security Presidential Directive (HSPD) 10, the U.S. Department of Homeland Security (DHS) is tasked to coordinate with other appropriate Federal departments and agencies, to develop comprehensive plans which, "provide for seamless, coordinated Federal, state, local, and international responses to a biological attack." As part of these plans, the U.S. Environmental Protection Agency (EPA), in a coordinated effort with DHS, is responsible for "developing strategies, guidelines, and plans for decontamination of persons, equipment, and facilities" to mitigate the risks of contamination following a biological weapons attack.

EPA's National Homeland Security Research Center (NHSRC) provides expertise and products that can be widely used to prevent, prepare for, and recover from public health and environmental emergencies arising from terrorist threats and incidents. NHSRC's Decontamination and Consequence Management Division (DCMD)'s decontamination research program's goal is to provides expertise and guidance on the selection and implementation of decontamination methods and provide the scientific basis for a significant reduction in the time and cost of decontamination events.

Past field experience and recent laboratory investigation have shown the effectiveness of several decontamination technologies for use against anthrax spores and other biological agents. The effectiveness of the technologies varies significantly as a function of operating conditions and challenge conditions (e.g., materials intended to be decontaminated). The use of chlorine dioxide (ClO_2) gas, fumigant hydrogen peroxide (H_2O_2), and methyl bromide has been shown to be effective in the field and laboratory when used in the appropriate circumstances. In addition to efficacy, the development of the remediation strategy also includes consideration of the ability to achieve effective conditions (e.g., fumigant concentration) within the application scenario and the impact of the decontamination process on materials and equipment.

VI. SCOPE

The purpose of this study is to determine the efficacy of methyl iodide fumigation on *Bacillus anthracis.* A secondary objective is to confirm the appropriateness of the use of *Bg* as a surrogate for *Ba* when testing with methyl iodide.

VII. TECHNICAL APPROACH

The contractor, upon approval from the EPA Work Assignment Contracting Officer Representative (WAM), shall procure all test equipment and materials to be included in the test sets. The contractor shall

conduct pre-screening and documentation of all test equipment and materials prior to exposure to the fumigation conditions in accordance with the approved Quality Assurance Project Plan (QAPP). The contractor shall set-up the experimental system necessary to complete the fumigation testing. The system shall allow for temperature, RH and methyl iodide concentration controlled exposures for up to 24 hrs. Additional conditions may be agreed upon after initial work has been completed.

VIII. TECHNICAL RISK

The technical risk involved in this project is minimal. The ultimate goal is to determine the sporicidal conditions for inactivation of Ba spores with methyl iodide on a variety of indoor materials that would typically be decontaminated with a fumigant such as wood, glass, concrete, metal, wallboard, etc. The null and alternative hypotheses are expected to be easily determined and verified.

IX. FACILITIES AND MATERIALS

All experimental efforts shall be performed by the contractor at one of their facilities. All materials and equipment for testing shall be provided by the contractor. The EPA WAM will determine the full material matrix in technical discussion with the contractor's work assignment leader.

X. TASKS

The following tasks are defined as part of this work assignment:

Task 1 – Preparation of Work Assignment Work Plan
A detailed Work Plan is due in accordance with terms and conditions of the contract.

Task 2 – Develop Test/QA Plan
A test/quality assurance plan shall be developed in accordance with EPA Guidelines for Preparation of Quality Assurance Project Plans (QAPP) and NHSRC Quality Management Plan (QMP). The test/QA plan shall detail roles/responsibilities, experimental methods, quality assurance/quality control measures, and data management and analysis procedures. Previous test/QA plans developed for similar testing (e.g., evaluation of fumigants for biological agent decontamination) would serve as the template for the test/QA plan. A draft test/QA plan shall be provided to EPA for review. Upon receipt of EPA review comments, a revised test/QA shall be prepared for EPA QA and peer review. EPA QA and peer review comments shall be incorporated into the final test/QA plan. No data collection shall begin until the QAPP is approved by the EPA COR.

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this work assignment (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

Task 3 – Experimental System Design and Preparation
The contractor shall prepare and test the experimental chamber that will be used for this testing. The chamber shall be capable of maintaining temperature, relative humidity, and methyl iodide concentration for up to 24 hour runs. The chamber shall be designed to allow for automated control and measurement for extended time experiments.

Task 4 – Evaluation of Methyl Iodide for Inactivation of *Bacillus anthracis* and *Bacillus atrophaeus*
Test coupons of porous and non-porous materials that would be decontaminated with MeI (e.g., glass, stainless steel, wood, carpet, wall board, concrete, and ceiling tile) shall be prepared in a size consistent with earlier decontamination testing for EPA's Decontamination and Consequence Management Division. The list of materials shall be agreed upon based on technical discussions with the EPA WAM and contractor WAL. Coupons shall be spiked with *B. anthracis* biological agent and *B. atrophaeus*. Associated quality control coupons (positive and negative controls) shall also be prepared. The test coupons shall then be exposed to a given concentration of MeI under controlled

temperature and relative humidity. After exposure to MeI, viable biological agents remaining on the test coupons shall be determined, and decontamination efficacy calculated.

A draft test matrix is shown in Table 1. This matrix shall be developed for the Test Plan based on technical discussions between the EPA WAM and contractor WAL to determine the best approach to satisfy the objectives. The effect of MeI concentration, exposure time, temperature and RH will be examined. Temperature will be varied from an elevated temperature of 100 °F down to room temperature of 70 °F. A total of 20 runs shall be assumed for developing the work plan estimate.

Adaptive management controls will be used to adjust the test conditions if data suggests different conditions should be used. An addendum to the QAPP shall be added if the Test Plan is changed.

Table 1: Test Matrix for Task 4

Test Number	Methyl Iodide Exposure Time (hrs)	Treatment Conditions
1	24	Methyl Iodide Fumigation: MeI concentration= 300 mg/l for 24 hours T=100 F, RH=70%
2	12	Methyl Iodide Fumigation: MeI concentration=300 mg/l for 12 hours T=100 F, RH=70%
3	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100F.
4	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100 F.
5	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100 F.
6	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100 F.
7	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100 F.
8	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100 F.
9	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100 F.
10	TBD	Methyl Iodide Fumigation: RH and MeI concentration to be determined. T=100F.

TBD=To be determined
Total number for estimate=20 runs

Task 5 – Reporting

All data collected per the QAPP shall be submitted to the EPA WAM within two weeks after the completion of the test matrix. The contractor shall submit a draft report on the compilation of results from the efficacy testing and material and equipment compatibility testing within 6 weeks from conclusion of tests. Compilation and analysis of testing data shall begin as soon as testing begins under Task 3, and data from all runs shall be compiled into an electronic format. Upon completion, compiled test data shall be provided to the EPA WAM in Microsoft Excel format. A summary report which covers the test conditions, methods, quality assurance, and results of evaluating Mel decontamination shall be prepared. The report shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). A draft of the report shall be provided for review and EPA WAM approval. The EPA WAM will obtain peer review and QA comments and will submit them to the contractor to revise the report. Upon receipt of review comments, the report shall be revised and a final version of the report shall be provided to the EPA WAM within 4 weeks after receiving comments.

It is anticipated the contractor WAL shall have ongoing technical communication with the EPA WAM on a bi-weekly basis where results to date can be discussed.

XI. DELIVERABLE SCHEDULE

- On a monthly basis for the duration of the project, the contractor shall submit to the EPA WAM, in electronic format, progress reports summarizing technical progress (including estimated percent of project completed), problems encountered, quarterly and cumulative financial expenditures and cost and schedule variance.

- A draft report shall be delivered to the EPA WAM no later than 08/30/2013.

Table 1: Deliverable Schedule

Deliverable	Date
Work Plan	20 days after receipt of work assignment
Data summaries	On-going
Draft Report	8/30/13

XII. REPORTING REQUIREMENTS

- The Contractor shall prepare Quality Control data reports of all facility-specific data. Each Quality Control report shall be in a format suitable for EPA/NHSRC publication and shall discuss how well various measurements described in the QA plan were met.
- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.
- After consultation with the EPA WAM, the contractor may submit draft journal papers suitable for publication for each task, in lieu of a final technical report. The papers may be authored or co-authored by the EPA WAM, which will be decided on a individual basis in consultation with the WAM. To serve in lieu of the final report, the journal articles must contain all of the relevant information that would have appeared in the final report. .
- All products developed under this SOW (e.g., the above mentioned technical report) shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013	Test & Eval Chem Detectors
	Base Option Period Number 3	

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Section 3

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 12/12/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The Contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for thits WA shall be the date of issuance through 08/31/2013. The contractor shall not perform any work on this WA prior to the effective date.

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 10/21/2009 To 08/31/2013 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name Shannon Serre (Signature) (Date)	Branch/Mail Code: Phone Number 919-541-3817 FAX Number:
Project Officer Name Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK
Work Assignment #3-13

TESTING AND EVALUATION OF TWO HAND HELD TOXIC INDUSTRIAL CHEMICAL DETECTORS

I. PERIOD OF PERFORMANCE
The period of performance for this Work Assignment (WA) shall be from date of issuance through August 30, 2013.

II. PURPOSE
In collaboration with the US Marine Corps, the EPA's National Homeland Security Research Center desires to test and evaluate two (2) commercially available hand-held multi-function detectors, the MSA SAFESITE® and the RAE Systems Rapid Deployment Kit (RDK) AreaRAE. The toxic industrial chemicals (TICs) of interest are spelled out in a later section. The performance characteristics to be evaluated include the ability to detect and identify target chemicals under both ideal and realistic operating conditions. The response time, accuracy, recovery time, temperature and humidity effects, and interference effects of the instruments will be assessed. Operational factors such as cold/hot start behavior, cost, ease of use, and data output capability will also be evaluated.

III. BACKGROUND
A critical component of EPA's homeland security mission is enhancing the capability of emergency responders to detect and measure toxic industrial chemicals and other compounds in the air and on surfaces. Detection and measurement technologies are necessary to support emergency responders during responses to intentional or accidental release of chemicals in indoor or outdoor environments. The potential users of these technologies typically only have access to vendor-supplied data and information when making a purchase or deployment decision. The users need unbiased, high-quality, objective, third-party data and information to ensure that the tools they purchase can truly meet their performance objectives and, most importantly, be protective of human health and the environment. Therefore, the purpose of this work assignment is to identify, test, evaluate, and report on the performance of technologies that can be used in support of the above-mentioned needs.

IV. TECHNICAL APPROACH
The Contractor shall adapt any existing test methods, protocols, and Quality Assurance Project Plans (QAPP) and shall demonstrate and quantify the performance of the selected handheld TIC monitors. The response time, recovery time, accuracy, and repeatability shall be evaluated by challenging the instruments with known vapor concentrations of target chemicals and compounds. Similar tests conducted over a range of temperatures and relative humidity (RH) shall be used to establish the effects of these factors on instrument capabilities. The effects of potential interferences in an emergency situation shall be assessed, by sampling those interferences both with and without the target TICs present. Testing the instruments after a cold start (i.e., without the usual warm-up period) and after hot storage shall evaluate the delay time

before readings can be obtained, and the response speed and accuracy of the instruments once readings are obtained.
Operational factors such as ease of use, data output, and cost shall be assessed by observations of the test personnel and through inquiries to the technology vendors.

Performance Parameters

The key performance parameters to be evaluated in this technology evaluation shall be:

- Response and Recovery Time
- Repeatability and Accuracy
- Effect of Operating Conditions (Temperature and Humidity)
- Cold/Hot Start Behavior
- Interference Effects
- Ease of Use

All of these performance parameters shall be evaluated with TICs as the target analytes. The operational characteristics of the units shall be recorded. These operational characteristics include: ease of use, signal/data output, and cost of the units.

Response and Recovery Time

At 23°C and 30% RH, the units shall be exposed to clean, humidified air for 5 – 10 minutes while a stable baseline concentration is established. At time=0 the desired chemical shall be introduced to the exposure chamber. The detector response and the time to alarm shall be recorded. At that point, clean air shall be introduced to the challenge manifold and the detector shall be allowed a maximum of 10 minutes to return to non-alarm status (zero baseline level). The time for the detector to return to non-alarm status shall be recorded as its recovery time. This challenge/clean air cycle shall be repeated for a total of five challenges.

Detector accuracy determinations shall be made by comparing detector output to the reference concentration. This shall be a comparison either with a reference method or by comparing the detector output to the calculated concentration of the chemical delivered from a certified, assayed source gas through NIST-traceable calibrated flow controllers and flow meters.

Repeatability and Accuracy

Repeatability shall be defined as the consistency of the instrument's indicated response to a constant vapor challenge concentration. Accuracy shall be defined as the degree of agreement between the chemical concentration indicated by the instrument and that measured by a reference method or known chemical concentration. The repeatability and accuracy of the units shall be determined as part of this work assignment.

Effect of Operating Conditions (Temperature and Humidity)

The effect that the temperature and relative humidity (RH) have on the instruments shall be evaluated. In all cases, the instrument undergoing testing shall be maintained at the same temperature as the challenge air stream. The challenge air stream also shall be maintained at the specified RH.

The effect of temperature and humidity shall be evaluated at 5 separate conditions as agreed upon between EPA WACOR and Contractor WAL through Technical Direction.

Cold/Hot Start Behavior

Each detector shall have its start-up delay time determined during the Response & Recovery experiment set. Each detector shall be stored at room temperature (22°C) for at least 12 hours prior to conducting this experiment. The detector shall be powered up and readied for a challenge. The elapsed time from power-up to "ready" shall be recorded. The detector shall be powered down for 15 minutes and the process repeated four more times.

The detector shall be placed into an environmental chamber held between 5 and 8°C and allowed to sit overnight. The startup delay time shall be measured as described in the previous paragraph. This test shall be conducted once per day for a total of five (5) days and may occur in parallel while testing with a different instrument. The detector shall then be placed into an environmental chamber held at 40 ± 3°C and allowed to sit overnight. The startup delay time shall be measured as described in the previous paragraph. This test shall be conducted once per day for a total of five (5) days and may occur in parallel while testing with a different detector.

The challenge TIC shall be chosen based on technical discussions with the EPA WACOR.

Interference Effects

The instruments shall be tested with various interferents. Interferents shall be introduced into the air stream employing the same basic protocols that are used for the TICs. Gas and diesel exhaust shall also be used. Other interferants may be added based on technical discussions between the Contractor and EPA WACOR. A total of 4 interferents shall be used in this work assignment.

The impact of interferences on the instrument response shall be assessed by comparison of response with a potential interferent present to that in the absence of interferent, under the same test conditions. All response readings with the interferent present shall be the same as those without the interferent present, or an interferent effect shall be inferred. For example, three positive and two negative responses in the presence of the interferent shall be judged as different from two positive and three negative responses in the absence of the interferent indications.

The interference data shall be evaluated in two ways. Data from the tests with interferent present alone shall be used to assess false positive readings, i.e., comparison of readings with interferent and clean air shall assess whether the instrument provides a positive indication of a TIC or agent due to the presence of an interferent. Data from the tests with both interferent and a TIC or agent shall be used to assess false negatives, i.e., the absence of a response to the TIC or agent when the interferent is present. A reduced or enhanced response to the TIC or agent when the interferent is present, relative to the response without the interferent, shall be taken as indication of a partial masking or interference in the instrument response.

Ease of Use

Key operational characteristics of the instruments shall be evaluated by means of the observations of test operators, and by inquiry to the manufacturers. Ease of use shall be assessed by operator observations, with particular attention to the conditions of use by first responders. For example, the use of PPE (e.g., gloves, respirator) may make it difficult to turn the instrument

on or off, operate it, or read the display. These factors shall be assessed by outfitting an operator with such PPE, and noting any difficulties in operating the instrument. This assessment shall be done separately from any test of the other performance parameters with TICs. The mode of data output, and cost shall be assessed by observations of the test personnel and through inquiries to the technology manufacturers.

V. TASKS

A list of compounds and chemicals that may be tested is listed below:

1) Hydrogen Sulfide (H_2S)
2) Sulfur Dioxide (SO_2)
3) Ammonia (NH_3)
4) Chlorine (Cl_2)
5) Phosphine (PH_3)
6) Hydrogen Cyanide (HCN)
7) Nitric Oxide (NO)
8) Nitrogen Dioxide (NO_2)
9) Carbon Monoxide (CO)

The EPA WACOR in technical consultation with the Contractor Work Assignment Leader will choose 3 TICs from this list to test.

The instruments that are being tested are being purchased by the US Marine Corp under a separate contract. This work assignment assumes that no additional equipment purchases will be necessary.

The work that shall be performed is broken down into the following tasks.

Task 1 – Preparation of Work Assignment Work Plan

A detailed Work Plan is due in accordance with terms and conditions of the contract.

TASK 2: Preparation and Approval of the Quality Assurance Project Plan (QAPP)

The Contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf based on the type of research that is being conducted. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this contract package (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The draft QAPP will be reviewed by the EPA COR and the EPA Quality Assurance Manager. The contractor shall respond to comments and submit the QAPP for final approval to the EPA COR and EPA Quality Assurance Manager. The QAPP, including any amendments, must be approved by the U.S. EPA in writing (e.g., signature on the approval page) prior to the start of any work. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf. The QAPP that was developed by the USMC as part of the overall testing and evaluation project can be edited and submitted with the addition of a QA section. The QAPP can also be based on the testing that was completed as part of WA 2-13.

TASK 3: Technology Testing and Evaluation
The Contractor shall follow the procedures described in the test/QA plan. As necessary, the Contractor shall operate the instrument being tested according to the procedures (i.e., standard operating procedures, method, instructions, etc.) provided by the instrument manufacturer and included in the test/QA plan. The testing may involve the following as appropriate for the selected technology category:

1. Interferent Characterization. The type and number of interferents to be tested shall be finalized with concurrence of the EPA WACOR. Interferent generation, analysis, and characterization methods shall be identified in the final test/QA plan.

2. Toxic Industrial Chemical (TIC) Testing. As many as three compounds shall be tested. The 4 interferents shall be tested at a single challenge concentration and environmental condition in the presence of the TIC. The TIC concentration shall vary as specified in the test plan. The final determination of which TICs to include in the test shall be made with technical direction from the EPA WACOR.

TASK 4: Data Analysis and Summary Report
The contractor shall compile and evaluate the results of the test. The data shall be compiled into a data report and into an electronic format. The data set shall be compiled in a fully documented electronic format. The data shall be evaluated according to the procedures described in the test/QA plan.

VI. DELIVERABLE SCHEDULE

1. On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress, problems encountered, monthly and cumulative financial expenditures, and cost and schedule variance.

2. Bi-weekly conference calls shall be established between the EPA WACOR and the contractor WAL. During these conference calls the WAL shall report on progress made in the project and any technical issues encountered in implementation of the test plan.

3. Within 30 calendar days of the issuance of this work assignment, the draft Quality Assurance Project Plan (QAPP) amendment shall be submitted to the EPA, in electronic format (Microsoft Word). The EPA WACOR will then coordinate peer and EPA QA review of the QAPP. The contractor shall then address any comments resulting from these reviews within 30 calendar days of receipt of the comments. The contractor shall then provide a final copy of the QAPP both in electronic and hard copy for EPA Approval. Work covered in this contract shall not begin until the QAPP has been approved by the EPA Quality Assurance Manager. The QAPPs shall contain work plans detailing how the experiments will be run and include a timetable for task

completion. The contractor shall adhere to QA requirements as delineated in "Attachment #1 and 2" to this SOW.

4. Within 60 calendar days of the end of testing the instruments a draft copy of the reports of performance of the instruments shall be submitted to the EPA WACOR. The EPA WACOR will then coordinate peer and EPA QA review of the reports. The contractor shall then address any comments resulting from these reviews within 30 calendar days of receipt of the comments.

5. The final reports shall be submitted to the EPA WACOR within 30 days of receiving comments on the draft report and no later than 8/31/13

VII. REPORTING REQUIREMENTS

- All products, e.g., QAPP, technical reports, generated under this WA shall be peer reviewed by at least one external (non-EPA) and at least one internal (EPA) reviewer. The EPA WACOR will coordinate the peer review of the draft documents and submit comments to the Contractor for product revision and comment response.
- All data shall be transferred to the EPA WACOR in electronic format, in MS Excel worksheets, before the submission of the draft summary report. The worksheets shall be adequately commented to ensure that the data presented is clearly identifiable.
- Transfer of project data to the EPA WACOR shall occur at the conclusion of the testing. This data includes reports of the conditions (e.g., concentrations, temperature, relative humidity, etc.) and all measured variables (e.g., contamination levels).
- All products developed under this SOW (e.g., the above mentioned technical report) shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Testing and Evaluation of Two Hand Held Toxic Industrial Chemical Detectors	
Description:	Testing and Evaluation of Two Hand Held Toxic Industrial Chemical Detectors	
Project ID:	IO 1.9.1	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	III	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Not Delivered	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-C-10-001
	Work Assignment Number:	3-13
	Delivery/Task Order Number:	NA
	Modification Number:	NA
	Other:	NA

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

No — Has a QAPP already been approved for the activities specified in the SOW?

Yes — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use

by the contractor? (QA approval must be obtained before the contractor can start work.)

Provide the expected title for submission to QA staff for approval:

Provide the approximate date for submission to QA staff for approval:
11/29/2012

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
R2 and R5	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with: Explain: The QAPPs shall be developed in accordance with the attachment #1 (QAPP requirements for applied research projects)
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Documentation will be identified in individual Statements of Work	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Shannon Serre NHSRC-IO Technical Lead Person	09 NOV 12 11/08/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	11/09/2012 11/09/2012 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions These studies are often pilot-

or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identifiedmeaning that organizations responsible for planning coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided including QC and reserve samples

3.5 All measurements (*i.e.*, analytical [chemical, microbiological assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described

4.3 Any site preparation needed prior to sampling/monitoring shall be described

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced If compositing or splitting samples, those procedures shall be described

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained

4.16 Sample archival requirements for each relevant organization shall be provided

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations(including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included

SECTION 7.0, DATA REPORTING , DATA REDUCTION , AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided

7.6 The product document that will be prepared for the project shall be specified(*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed

8.3 The responsible party(-ies) for implementing corrective actions shall be identified

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality

assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-18

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Rpt of Inter-Lab Validation

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Sections 3.1, subsections 4, 5 and 7

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 12/31/2012

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/2012. No work shall be performed by the contractor prior to the WA effective date. Note: Period of performance for this WA shall be 09/01/12 - 12/31/12.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Keya Sen (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7026 FAX Number:
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

WORK ASSIGNMENT 3-18
PERFORMANCE WORK STATEMENT

Period of Performance: September 1, 2012 to December 30, 2012

Title: Report of the Inter-laboratory validation of a culture- qPCR method to detect *E. coli* O157: H7 in water.

PWS Contract# EP C 10-001, Sections: 3.1 (Testing and Evaluation Process). **Sub-sections: 4, 5 and 7** (Components of Technology Testing and Evaluation Work Assignment)

I. PURPOSE

The purpose of this Work Assignment (WA) is to finalize the report of the study that was performed in the previous option period to support the inter-laboratory validation of a culture- qPCR method to detect *E. coli* O157: H7 in water. The inter-laboratory validation study determined if the method can be reproduced and repeated for the routine detection of less than 10 cells in un-disinfected ground water by a number of laboratories using a polymerase chain reaction (PCR) method. In addition, in this period the method will be tested using instruments other than ABI Sequence Detection System instruments, a phase -2 study already begun in the previous option period, in order to examine if they give comparable results to those obtained in an ABI thermocycler. This will increase the usability of the method. Finally, the draft method will be updated. The intended audience for this project is molecular laboratories performing work on environmental waters.

This WA supports the mission of EPA's Office of Water (OW) under EPA's *Strategic Plan* GPRA Goal 2 (Clean and Safe Water), Objective 2.1 (Protecting Human Health), Sub-objective 2.1.1 (Water Safe to Drink).

II. BACKGROUND

In 2009, the US EPA listed *Escherichia coli* (*E. coli*) O157:H7 in the Contaminant Candidate List (CCL) for regulatory considerations under the 1996 Amendments of the Safe Drinking Water Act. *E. coli* O157:H7 has caused several outbreaks in North America. Infection with these bacteria can cause bloody diarrhea that can ultimately lead to kidney failure and death. The organism can be intentionally introduced into the water system. Thus it can be a potential threat to water security. Since *E. coli* O157:H7 cells, if present in water, will be at very low levels, a sensitive and specific method is needed to detect them.

EPA has developed a method that can detect less than 10 cells/liter of drinking water using multiplex qPCR assays. (Environ. Sci. Technol. (2011), 45, 2250-2256). The multiplex qPCR assays target 6 genomic regions within the *E. coli* O157:H7 cell and two additional DNA targets as internal controls. Since PCR can lead to significant false negative and false positive results if performed incorrectly, data defensibility for environmental samples analyzed using these methods becomes a formidable issue. The method has undergone a 5 laboratory validation. This validation was successfully performed with the

contractor's help in work assignment 2-18 under option period 2 and a draft report on the process and the outcome of validation was developed. In this period a final report will be generated so that other laboratories may be able to use the protocols, the QA/QC followed, and the variance observed within and between laboratories, in designing their own protocols and criteria for a qPCR method validation. In addition, in option period 2, a phase -2 study was begun to understand the compatibility of thermocyclers, other than ABI thermocyclers, that are able to perform the triplex reactions with the three fluorescent reporters, FAM, VIC and NED. Study instructions were prepared in option period 2 for this second phase of validation and initial practice qPCR runs performed using two instruments, Eppendorf Mastercycler Ep realplex^4 and BioRad iQ 5, by two new laboratories. In this period the two new laboratories will perform the final qPCR runs where they will use the DNA extracts generated in phase 1, option period 2, from two (of the five that participated in the validation) laboratories. The contractor shall submit raw data obtained from the different qPCR assays from the two laboratories, in a tabular form and develop a summary of the results where Phase 1 and Phase 2 will be statistically compared. Finally, the method shall be updated with the most recent results and delivered to the EPA WACOR in both electronic format and hard copy.

III. QUALITY ASSURANCE REQUIREMENTS

Task 1-5 in this WA require the use of primary and/or secondary data. Collection, use and analysis of data will be identical to the procedures described in the Project-Specific Quality Assurance Project Plan (PQAPP) completed under Task 1 of WA 2-18 , consistent with the Agency's quality assurance (QA) requirements. The project specific quality assurance requirements must be addressed in the monthly progress reports as specified under Task 0, below.

IV. DETAILED TASK DESCRIPTION

All direction under this WA will be provided as written technical direction from the Work Assignment Manager (WACOR). If provided first as verbal technical direction to the contractor, it will be confirmed in writing within 5 calendar days, with a copy to the Project Officer and the Contracting Officer, and is subject to the limitations of Contract Clause H.21. Each initial deliverable shall be provided to the EPA WAM and EPA PO in draft form for review and comment. The contractor shall incorporate WACOR review comments into revisions of the drafts. All drafts and final reports shall be approved by the WACOR.

The contractor shall perform the following tasks:

TASK 0: WORK PLAN AND MONTHLY PROGRESS REPORTS

The contractor shall develop a work plan that describes how each task will be carried out. The work plan is due 20 days after receipt of the approved work assignment and shall include a schedule, staffing plan, level of effort (LOE), and cost/fee estimate for each task, the contractor's key assumptions on which

staffing plan and budget are based, and qualifications of proposed staff. If a subcontractor(s) is proposed and subcontractors are outside the local metropolitan area, the contractor shall include information on plans to manage work and contract costs.
In addition, the contractor shall prepare a statement indicating that this WA is a continuation of EP-C-10-001 WA 2-18. The workplan shall explain that collection, use and analysis of data in this work assignment will be identical to the procedures described in the PQAPP completed under task 1 of WA 2-18. This task also includes monthly progress and financial reports. The monthly progress report shall indicate, in a separate QA section, whether significant QA issues have been identified and how they are being resolved. Monthly financial reports shall include a table with the invoice LOE and costs/fee broken out by the tasks in this WA. The contractor shall immediately notify the Project officer and WA manager if any changes to the tasks involving the collection and analysis of the data occur and prepare a new PQAPP. Work on these tasks cannot proceed until the contractor receives notification of the new PQAPP approval from the PO via e-mail.

In addition, in each monthly progress report, the contractor shall, at the introduction to the discussion of this WA, discuss actual progress toward achieving the purpose of this WA, including problems encountered, issues that may need to be resolved, and anticipated timing for completing the goals of the WA. The contractor shall provide an overview of contract projects, striving to implement efficiencies in performance when complimentary requirements are issued. The contractor shall assure that duplication of effort relative to other ongoing or previous WAs under this contract is not occurring.

Deliverables: Work plan, monthly progress and financial reports.

Task 1: REPORT DELIVERY

A final report based on the earlier draft report submitted in option period 2 for the phase 1 studies, will be reviewed by the EPA WACOR, and comments on this report will be returned to the contractor (if necessary) for clarification/modification/revision. The contractor shall then provide a final report addressing all EPA comments and questions.

Deliverable: Final report.

TASK 2: DELIVERY OF RAW DATA FROM PHASE 2

The contractor shall obtain the raw data from the participant laboratories from the Phase 2 laboratories and provide this information, in an excel spreadsheet, to EPA WACOR. The data shall be presented in Ct values and difference in Ct values between pre and post enrichment samples.

Deliverable: Raw data from laboratories compiled in spread sheet

TASK 3: DELIVERY OF SUMMARY OF RESULTS COMPARING PHASE 1 AND PHASE 2 STUDY
The contractor shall statistically compare the results from the two phases and submit a summary sheet on the compatibility of different thermocyclers.

Deliverable: Summary sheet comparing the thermocyclers

TASK 4: METHOD UPDATE

The contractor shall update the method already developed by the WACOR based on the data obtained from the interlaboratory validation and shall provide editorial help so that the method is in the EMMC format.
Deliverable: Updated method

Task 5: The method will be reviewed by three reviewers and the comments will be inserted or answered by the contractor together with EPA WACOR's input. s help.

Deliverable: Final method

V. SCHEDULE/DELIVERABLES

Task Number	Product/Action	Due Date	Responsible Party
0	Work Plan	20 days after receipt of WA	Contractor
1	Submission of final report	30 days after issuance of WA	Contractor
2	Delivery of Raw Data from Phase 2 in tabular form	7 days after completion of study	Contractor
3	Delivery of summary sheet from phase 2 study	14 days after TD	Contractor
4	Method Update	15 days after TD	Contractor
4	Review /Approval of Method	21 days after Method update	EPA/outside reviewers
5	Insert outside reviewer's comments	10 days after receipt of TD	Contractor/EPA
5	Final Method	15 days after receipt of TD	EPA/Contractor

VI. REPORTING REQUIREMENTS

Monthly Progress Reports (including a progress evaluation discussion).
Financial Reports.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-20

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Investigation of AOP for trmt

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	Section 2, paragraph 1, item C

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The Contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA is 09/01/12. No work shall be performed by the Contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name Matthew Magnuson (Signature) (Date)	Branch/Mail Code: Phone Number 513-569-7321 FAX Number:
Project Officer Name Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK

Investigation of advanced oxidation processes (AOP) for the treatment and disposal of drinking water contaminated with toxic chemicals into public sewer (collection) systems

Contract Number EP-C-10-001
WA 3-20

I. TITLE

Investigation of advanced oxidation processes (AOP) for the treatment and disposal of drinking water contaminated with toxic chemicals into public sewer (collection) systems

II. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from the date of award through 8/31/2013

III. BACKGROUND

The EPA's National Homeland Security Research Center (NHSRC) conducts research to protect, detect, respond to, and recover from terrorist attacks on the nation's water and wastewater infrastructure. The Water Infrastructure Protection Division, conducts research on the treatment of public drinking water purposely contaminated with toxic industrial chemicals, pesticides, or chemical warfare agents. The intent is to expeditiously and safely clean up the drinking water system and get things back to normal operation. As a preferred approach, the contaminated water would be treated and then discharged to the public sewer system. A potential concern is that the waste water, although adequately treated to remove the contaminant of human health concern, will contain hazardous by-products or other constituents toxic to microorganisms used in the waste water treatment process. On at least two recent occasions, public sewer systems have refused to accept treated water and it had to be hauled to another location. A contamination event resulting in thousands of gallons of water will make this infeasible. Sufficient experimental data must be available to convince local and state officials charged with making tough decisions on the clean up and disposal of contaminated water in the event of such an attacks. This data should be aimed at goals of protecting human health while ensuring continuity of operation of the waste water treatment plant, which is infrastructure critical to both 1) ensuring sanitation and public health and 2) continuing clean-up operations from the contamination event.

IV. OBJECTIVE

The objective of this Work Assignment is to increase the scientific understanding of using ozone with hydrogen peroxide, as well as other AOPs, to break down chemical contaminants to something relatively nontoxic and suitable for public sewer discharge. Additional knowledge in this area will be useful to water utilities and other decision-makers in assessing impacts of

discharge to the sewer treatment plan of water purposefully or accidentally contaminated with toxic industrial chemicals, pesticides, or chemical warfare agents.

V. SCOPE

This study involves studying the reaction between chemical contaminants of interest and AOPs, such as ozone with hydrogen peroxide. This research will look at the effectiveness of using ozone with hydrogen peroxide, as well as other AOPs, to break down the contaminant to something relatively nontoxic and suitable for public sewer discharge. Suitability for public sewage discharge will be assessed through testing of the water destined for sewer discharge for the ability of the potentially discharged water to impact the ability of the microorganism within the sewage treatment plant to continue to perform their intended function of breaking down "normal" plant influents.

The studies began under WA-20 in the previous option year of the contract. The studies progressed slower than anticipated; therefore this WA continues reporting of work completed in the previous option year, but does not duplicate them. In addition, based on technical information revealed in the reporting of work completed in the previous option year, this task adds additional experimentation that does not duplicate prior work to fill in knowledge gaps not covered by the contaminants previously studied.

VI. TASKS

The Contractor shall respond with a Work Plan within 20 calendar days of the approved Work Assignment. Content shall be in accordance with terms and conditions of the contract.

The Contractor shall perform the following tasks:

Task 1. Develop Study Report based on data collected during previous option period

Within 7 days following the acceptance of this work assignment, the Contractor shall develop a draft study report, in Microsoft Word, and deliver the draft to the EPA Work Assignment Contracting Officer Representative (WACOR) for review. EPA will review the draft and provide any comments and changes within 7 days. The Contractor shall incorporate any changes and deliver a final report within 7 days following receipt of EPA comments. The Contractor shall also deliver all experimental data to EPA in electronic format (i.e., Excel or Excel-readable format) along with the final report.

This draft study report is intended to summarize findings of the work conducted under the first option period, which should inform later tasks in this WA. It is anticipated that content from the study report generated in this Task 1 will be directly useful for development of the Study Report in Task 5. The contractor shall receive technical direction from EPA as to the level of detail in the study report in task 1.

Task 2. Propose a Study Design for Conducting AOP experiments.

Within 7 days of the completion of Task 1, the the Contractor shall develop and submit for EPA WACOR approval a proposed plan for conducting the additional experiments suggested by the results of Task 1. This may involve experimentation with additional contaminants to fill in knowledge gaps not covered by the contaminants previously studied. It may also involve evaluation of an additional AOP technology. For costing purposes, the contractor s shall assume that the level of effort is equivalent to evaluation of an additional AOP technology using the QAPP utilized for experiments in the previous option period.

EPA will review the plan and return comments within 7 days following submission to the EPA WACOR. The Contractor shall incorporate EPA comments into a final plan within 7 days following receipt of EPA comments for EPA approval.

Task 3. Prepare Quality Assurance Project Plan

The Contractor shall develop data quality objectives, which in turn shall serve as the basis for the quality assurance plan. The EPA WACOR will provide technical direction (via Technical Direction Memorandum) to the Contractor when clarification or direction is necessary. The Contractor shall prepare a Quality Assurance Project Plan (QAPP) that complies with all requirements delineated under "Quality Assurance" below. It is anticipated that the QAPP prepared for work during the previous option period can be modified with minimal effort.

Task 4. Perform AOP experiments, including SPMPT testing.

Within 60 days following EPA approval of the study design developed under Task 2, the Contractor shall perform the studies to determine the ability of the AOPs to meeting criteria for acceptance by wastewater treatment plans, as described by the QAPP from the previous option year's effort.

Task 5. Develop Study Report for additional work

Within 15 days following completion of Task 4, the Contractor shall develop a draft study report, in Microsoft Word, and deliver the draft to the EPA WACOR for review. This study report may be a revision of the study report developed in Task 1 (i.e. inserting the new chemicals or AOP technology), or it may be a separate depending on nature of revisions to the study design in Task 2, and which is of greatest value both scientifically and economically. Accordingly, the contractor shall receive technical direction from EPA before deciding on a format of the report. EPA will review the draft and provide any comments and changes within 15 days. The Contractor shall incorporate any changes and deliver a final report within 15 days following receipt of EPA comments. The Contractor shall also deliver all experimental data to EPA in electronic format (i.e., Word) along with the final report.

In addition to discussing experimental results, the study report shall include a "how-to" section that describes how an interested party would implement AOP in a field operation, including description of available commercial equipment, along with operational considerations. The Contractor shall draw upon the information uncovered during the literature review task conducted in the previous option period regarding commercially available equipment, as well as operational considerations revealed from the laboratory work. Thus, it is anticipated that the Contractor shall already possess most of the required information for this report. This "how-to" sections shall be presented as a stand-alone section or appendix. It is not anticipated that this will be more than 10 pages of text, not including figures.

DELIVERABLE SCHEDULE

Task 1. **Within** 7 days following approval of the Work Plan.

Task 2. **Within 7 days of completion of Task 1.**

Task 3. **Revise QAPP within 7 days of Task 2.**

Task 4. Study performed to generate data regarding the acceptability of AOP treated contaminated water samples to wastewater utilities with 60 days of EPA approval of revised QAPP.

Task 5. Draft study report within 15 days following completion of Task 4 and final report within 15 days following EPA approval of the draft report and no later than August 31, 2013.

REPORTING REQUIREMENTS

On a bi-monthly basis for the duration of the project, the Contractor shall submit in electronic format (e.g. Word, PDf, and Email) a status report summarizing technical progress, problems encountered, and budget expended to date.

QUALITY ASSURANCE

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-22

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Assmt of Fate of RDD Contamina

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Section 3.1

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/06/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA shall be from date of issuance through 8/31/13.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Emily Snyder (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-1006	
	FAX Number:	
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 541-754-4502	
	FAX Number:	
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2852	
	FAX Number: 513-487-2107	
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2029	
	FAX Number: 513-487-2109	

STATEMENT OF WORK

ASSESSMENT OF THE FATE OF RDD CONTAMINATION AFTER LAUNDERING OF SOFT POROUS MATERIALS

OMIS C.2.2.2

TABLE OF CONTENTS

I. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from the date of issuance through August 31, 2013.

II. SUMMARY OF OBJECTIVES

The current recommendation for radioactively contaminated clothing is to take the clothing off and bag it. It is unknown exactly how effective washing is for removing RDD contamination from clothing items and perhaps, more importantly, the impacts of the general public knowingly or unknowingly washing their contaminated clothing are not characterized. The objective of this work is specifically to determine the efficacy of washing for removal of RDD contamination (focus on Cs137Cl RDD) and determine the fate of this Cs137 contamination after washing. The amount of Cs137 that exits the washer and is dumped into the wastewater will also be determined. This work is builds upon a previous effort to evaluate the fate of Cs137 so the test methods, protocols, as well as the previously approved Quality Assurance Project Plans (QAPP), and previously used facilities are applicable to this Statement of Work. It is anticipated that these previously developed products will be used or adapted to the greatest extent possible. Modifications in detection methods may be necessary due to the introduction of new test materials (bulky items in addition to swatches) which will necessitate different measurement methodologies.

The following will be measured using a top loader washing machine:

- The activity of the clothing items before and after placing in the washer,
- The activity of the water leaving the washer,
- The activity of the washer components after all of the tests are complete.

EPA emergency responders will use these data to construct self help guidance for the general public.

III. BACKGROUND

The U.S. Environmental Protection Agency (EPA) is the agency responsible for environmental cleanup after the release of a radiological dispersal device. It's Office of Research and Development National Homeland Research Center is therefore tasked to perform scientific studies to inform this cleanup. One aspect of this cleanup is recommendations for the general public. This study will inform these recommendations that are related to the laundering of clothing and other porous soft surfaces.

IV. TECHNICAL APPROACH

The Contractor shall adapt existing test methods, protocols, and shall quantify the activity of the clothing items before and after they are placed in the washer as well as the activity of the water leaving the washer. The Contractor shall also determine the activity of the washer components after all of the tests are complete. Some of the tasks listed above were completed during the previous option period. These tasks are provided for informational purposes only and will be noted and the text is italicized.

V. TASKS

TASK C1: AMENDMENT OF THE APPROVED QAPP PLAN (COMPLETED)

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall amend the existing QAPP "Quality Assurance Project Plan for Assessment of the Fate of RDD Contamination after Laundering of Soft Porous Materials" in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved by EPA prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

The draft QAPP amendment will be reviewed by the EPA WAM and the EPA Quality Assurance Manager. The contractor shall respond to comments and submit the QAPP for final approval to the EPA WAM and EPA Quality Assurance Manager. The amended QAPP, including any amendments, shall be approved by the EPA in writing (e.g., signature on the approval page) prior to the start of any work.

TASK C2: DEVELOPMENT OF DETECTION METHOD FOR THE BULKY SOFT POROUS SURFACES (COMPLETED)

The Contractor shall propose the method that will be used to contaminate and characterize the 12 by 12 inch portions of bulky item (item TBD by EPA WAM) both before and after deposition of the contamination (at a minimum the characteristics, distribution, and amount of contamination), and after the swatches of materials have been laundered.

TASK C3: TECHNOLOGY TESTING WASHING - EXECUTION

TASK C3.1 Test Sample Preparation ***(COMPLETED)***

The contractor shall obtain 6 by 6 inch swatches of soft porous materials (cotton and polyester). The EPA WAM will provide the specifications of these materials to the contractor. The contractor shall also procure bulky item (exact specifications will be provided by the EPA WAM via TDM) and cut it into 12 by 12 inch sections.

Task C3.2 Contamination of Test Coupons

All test coupons (5) and positive control coupons (2) shall be contaminated with Cs137Cl in the horizontal orientation. These coupons shall be allowed to sit for as long as necessary for the surface to dry.

Task C3.3 Measurement of Cesium Activity on the Test Coupons

Activities on the positive control coupons and the test coupons shall be measured before and after laundering with the top loader washing machine. The measured activities from the positive control coupons and the test coupons shall be used to

calculate the decontamination factor. The contractor shall also measure the activities of the 5 procedural blanks before and after they are washed with the test coupons.

Task C3.4 Decontamination Technology Evaluation – Washing Without Detergent ***(COMPLETED)***
The contractor shall launder 5 polyester test coupons with a blank coupon of the polyester without detergent using the cold rinse/cold wash cycle (this yields 1 procedural blank per each test swatch – 5 total). The activity remaining on the test swatches and the activity of the wash water shall be measured for each test replicate.

Task C3.5 Decontamination Technology Evaluation – Cross Contamination
The contractor shall launder each of the 5 test coupons with a blank coupon of the same material to determine cross contamination (this yields 1 procedural blank per each test swatch – 5 total). In addition to these swatches, the contractor shall place two T-shirts and two pairs of jeans in with the contaminated swatch. The contractor shall do this for the remaining test matrix which is outlined below in Table 1. Between the tests a blank cotton swatch will be washed in the washer to assess cross contamination. All tests will be completed using detergent (exact detergent will be determined by the EPA WAM). The activity remaining on the test swatches and the activity of the wash water shall be measured for each test replicate.

Table 1: Remaining test matrix for cross contamination testing.

Material/ Swatch Size	Wash/Rinse Temperature	Other Condition	Test Swatches	Positive Control	Procedural Blank	Machine Blank
Polyester/ 6x6 in	Cold/Cold	Detergent; include other clothing	5	2	5	1

Task C3.6 Decontamination Technology Evaluation – Fate of Cesium During Laundering of Bulky Items

The contractor shall launder each of the 5 replicate bulky items (12 by 12 inch sections cut from the bulky item) with a blank replicate item of the same material to determine cross contamination (this yields 1 procedural blank per each test swatch – 5 total) for two different bulky item types (outlined in Table 2). All tests will be completed using detergent (exact detergent will be determined by the EPA WAM). The activity remaining on the test swatches and the activity of the wash water shall be measured for each test replicate. After all of these tests are completed (Tasks C3.3-tasks C3.5) the contractor shall measure the activity of the washer components.

Table 2. Remaining test matrix for bulky material testing.

Material/ Swatch Size	Wash/Rinse Temperature	Other Condition	Test Swatches	Positive Control	Procedural Blank	Machine Blank
Cotton bulky/ comforter 12x12 in	Cold/Cold	Detergent	5	1	5	1
Cotton bulky towel/ 12x12 in	Cold/Cold	Detergent	5	1	5	1

TASK C4: FINAL REPORT

The Contractor shall perform data analysis to determine individual and average decontamination factors for each of the materials. The contractor shall also provide a technical report in accordance with EPA/ORD technical report requirements which shall document the results of Task C3, including all data generated. This report can use the introduction and much of the experimental section of the previously completed report.

VI. DELIVERABLE SCHEDULE

1. On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress, problems encountered, monthly and cumulative financial expenditures, and cost and schedule variance.

2. Bi-weekly conference calls shall be established between the EPA WAM and the contractor project officer during construction of the QAPP and once experimental work has commenced. During these conference calls the contractor shall report on progress made in the project and any technical issues encountered in implementation of the test plan.

3. *Within 30 working days of the issuance of this work assignment, a Quality Assurance Project Plan (QAPP) shall be provided to the EPA, in both electronic format (Microsoft Word, and Adobe), for Task C1-3. The EPA WAM will then coordinate peer and EPA QA review of the QAPPs. The contractor shall then address any comments resulting from these reviews within 30 working days of receipt of the comments. The contractor shall then provide a final copy of the QAPP both in electronic and hard copy for EPA Approval. Work covered in this contract shall not begin until the QAPP has been approved by the EPA Quality Assurance Manager. The QAPPs shall contain work plans detailing how the experiments will be run and include a timetable for task completion. The contractor shall adhere to QA requirements as delineated in "Attachment #1 and 2" to this SOW.* ***(COMPLETED)***

4. Transfer of project data (including raw data) shall occur at the conclusion of the work assignment which is scheduled for August 31, 2013.

5. A technical report shall be submitted within 8 weeks after the completion of the testing in Task C1-3 and no later than August 31, 2013.

VII. REPORTING REQUIREMENTS

1. Data generated as a result of this effort shall be shared with the EPA WAM for internal EPA use.

2. Laboratory data shall be transferred electronically to the EPA WAM after the conclusion of each task.

3. The technical report generated under this Work Assignment shall be subject to one internal EPA review and one external review.

4. Products generated under this Statement of Work shall conform to the requirements of EPA's Handbook for Preparing Office of Research and

Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

5. Prior to submission of the technical report, all of the data shall be provided to the EPA WAM in electronic format, specifically Microsoft Excel® spreadsheets. The data contained in these spreadsheets shall be presented and annotated so as to be readily understandable to a wide audience.

6. Copies of any internal audit reports and responses shall be sent to the EPA WAM in a timely fashion. The WAM and EPA Quality Assurance Manager shall be immediately notified of any critical findings.

7. The contractor shall document all data analyses including statistical models and related assumptions.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-22

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	09/01/2011 To 08/31/2013 Base Option Period Number 3	Assmt of Fate of RDD Contamina

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	Section 3.1

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/06/2012 To 08/31/2013

Comments:
WA Amendment 01 shall change SOW Section VI DELIVERABLE SCHEDULE #4 to read: All experiments in Task C1-3 shall be complete and the resulting QAed data shall be transmitted to EPA by 3/31/13. And #5 shall be revised to read: A technical report shall be submitted within 8 weeks after completion of testing in Task C1-3. No contractor Work Plan is required unless there is a change in LOE or cost/fee.

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	09/01/2011 To 08/31/2013		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:		Cost/Fee:	LOE:
Cumulative Approved:		Cost/Fee:	LOE:

Work Assignment Manager Name	Emily Snyder	(Signature) / (Date)	Branch/Mail Code: Phone Number 919-541-1006 FAX Number:
Project Officer Name	Kathy Martin	(Signature) / (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name	Adam Meier	(Signature) / (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name	Matthew Growney	(Signature) / (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-22

☐ Other ☒ Amendment Number: 000002

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Assmt of Fate of RDD Contamina

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Section 3.1

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/06/2012 To 08/31/2013

Comments:
Work Assignment Amendment 02 shall add Task V C5 "Develop Presentation for 2013 Decontamination Conference" per attached Statement of Work

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): 22

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Emily Snyder (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-1006	
	FAX Number:	
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 541-754-4502	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Charles McCormick (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2047	
	FAX Number:	

STATEMENT OF WORK

AMENDMENT 1 - ADDITIONAL TASK

ASSESSMENT OF THE FATE OF RDD CONTAMINATION AFTER LAUNDERING OF SOFT POROUS MATERIALS

OMIS C.2.2.2

TABLE OF CONTENTS

I. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from date of issuance through August 30, 2013.

II. SUMMARY OF OBJECTIVES

The current recommendation for radioactively contaminated clothing is to take the clothing off and bag it. It is unknown exactly how effective washing is for removing RDD contamination from clothing items and perhaps, more importantly, the impacts of the general public knowingly or unknowingly washing their contaminated clothing are not characterized. The objective of this work is specifically to determine the efficacy of washing for removal of RDD contamination (focus on Cs137Cl RDD) and determine the fate of this Cs137 contamination after washing. The amount of Cs137 that exits the washer and is dumped into the wastewater will also be determined. This work is builds upon a previous effort to evaluate the fate of Cs137 so the test methods, protocols, as well as the previously approved Quality Assurance Project Plans (QAPP), and previously used facilities are applicable to this Statement of Work. It is anticipated that these previously developed products shall be used or adapted to the greatest extent possible. Modifications in detection methods may be necessary due to the introduction of new test materials (bulky items in addition to swatches) which will necessitate different measurement methodologies.

The following shall be measured using a top loader washing machine:

- The activity of the clothing items before and after placing in the washer,
- The activity of the water leaving the washer,
- The activity of the washer components after all of the tests are complete.

EPA emergency responders will use these data to construct self help guidance for the general public.

III. BACKGROUND

The U.S. Environmental Protection Agency (EPA) is the agency responsible for environmental cleanup after the release of a radiological dispersal device. It's Office of Research and Development National Homeland Research Center is therefore tasked to perform scientific studies to inform this cleanup. One aspect of this cleanup is recommendations for the general public. This study shall inform these recommendations that are related to the laundering of clothing and other porous soft surfaces.

IV. TECHNICAL APPROACH

The Contractor shall adapt existing test methods, protocols, and shall quantify the activity of the clothing items before and after they are placed in the washer as well as the activity of the water leaving the washer. The Contractor shall also determine the activity of the washer components after all of the tests are complete. Some of the tasks listed above were completed during the previous option period. These tasks will be noted and the text is italicized.

V. TASKS

TASK C5: DEVELOP PRESENTATION FOR 2013 DECONTAMINATION CONFERENCE

The Contractor shall draft a slide presentation for the 2013 Decontamination Conference. This presentation shall include synthesis of the results from this project. A draft of the presentation is due 1 month from award of this new task. A final presentation shall be due 8 weeks after award of this new task.

VI. DELIVERABLE SCHEDULE

1. Deliver a draft presentation for the Decontamination Conference 4 weeks from award of this new task. A final presentation shall be due 8 weeks after award of this new task.
2. Monthly progress reports and biweekly calls are not required for this task. The Contractor shall only submit financial reports for this task.

VII. REPORTING REQUIREMENTS

1. Products generated under this SOW shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-23

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Methyl Bromide Decontamination

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	3.1 Testing and Evaluation Process

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract EP-C-10-001 Option Period III. The contractor, under this WA, shall not duplicate work completed under any previous WA. The effective date for this WA shall be from the date of issuance through 08/31/2013. Funding from PR-ORD-12-03553

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Joe Wood (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-5029	
	FAX Number: 919-541-0496	
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 541-754-4502	
	FAX Number:	
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2852	
	FAX Number: 513-487-2107	
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2029	
	FAX Number: 513-487-2109	

STATEMENT OF WORK
Contract EP-C-10-001

Work Assignment 3-23

I. TITLE

Methyl Bromide Decontamination of Materials Contaminated with Anthrax

II. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from award date - August 31, 2013.

III. SUMMARY OF OBJECTIVES

This work will provide data on the effectiveness of methyl bromide (MeBr) to inactivate *B. anthracis* spores on a number of materials, at ambient temperature and relative humidity (RH).

IV. RELEVANCE

The results of these tests will provide the decontamination technology user and stakeholder with high quality, peer-reviewed data on the effectiveness of MeBr to decontaminate a number of indoor and outdoor materials contaminated with *B. anthracis* spores and a surrogate. Tests will be conducted at typical room temperature and room RH. The results of the work will be made available to the homeland security and emergency response community through published reports, journal papers, and/or conference presentations/proceedings. The information will also be used to develop guidance documents pertaining to specific threat agents and release scenarios.

V. BACKGROUND

The U.S. Environmental Protection Agency (EPA) has the responsibility for protecting human health and the environment from accidental and intentional releases of hazardous and toxic materials. According to Homeland Security Presidential Directive 10 (HSPD-10), the EPA is tasked with developing strategies, guidelines, and plans for decontamination of persons, equipment, and facilities following a biological weapons attack. In response to this directive, the EPA Office of Research and Development (ORD) National Homeland Security Research Center's (NHSRC) Decontamination and Consequence Management Division (DCMD) is investigating methods and technologies for the inactivation of spores (e.g., *Bacillus anthracis* Ames) on materials/surfaces. This work will build on the decontamination studies that have already been conducted.

VI. SCOPE

The primary purpose of the study is to investigate the use of MeBr fumigation to inactivate anthrax spores. Sufficient replicates, blanks, and positive controls shall be used, consistent with standard microbiological and quality assurance procedures, past work conducted by the contractor, and studies being currently conducted by the contractor.

VII. TECHNICAL APPROACH

For each decontamination test, the effort shall include the recovery of viable agent from each material before (positive control) and after decontamination. Five replicates for each agent-material combination shall be included in each experiment. All experiments described below shall be approved by the EPA Work Assignment Contracting Officer Representative (WACOR) prior to commencement. Test and analytical methods shall be adopted from past or on-going efforts, in technical consultation with the WACOR.

VIII. TASKS

The Contractor shall perform the following tasks:

1. Provide a contractor Work Plan in accordance with the terms and conditions of the contract.

2. Prepare an amendment to the Quality Assurance Project Plan (QAPP) that was developed under WA 2-01 (Decontamination of Soil Contaminated with *B. anthracis*) for the experiments listed in this Statement of Work. Microbiological procedures, coupons, and measurement of temperature, RH, and MeBr fumigant concentrations, etc. shall be consistent with procedures used under previous projects with EPA.

3. The contractor shall build and test the experimental chamber that will be used for the testing described in this Work Assignment (WA). The chamber shall be capable of maintaining temperature, relative humidity, and methyl bromide concentrations as desc4ribed in this WA. The chamber shall be designed to allow for automated control and measurement for extended time periods.

4. Conduct experiments to quantitatively determine the effectiveness (log reduction) of inactivating *B. anthracis* (Ames strain) on six materials using MeBr gas. The materials for testing shall be selected in technical consultation with the WACOR at the time of developing the QAPP amendment (Task 2), and may include such indoor and outdoor materials such as the ceiling tile, carpet, glass, painted wallboard, wood, and concrete. Three to four MeBr concentrations shall be tested, with 4-5 different elapsed times. Elapsed times may be as long as 48 hours or more. The majority of tests shall be conducted at ambient temperature, with RH controlled to a low level, such as 45%. However, a few tests may be conducted at alternate RH and T. A total of 20 runs (number of concentrations tested x number of elapsed times tested x number of environmental conditions [T and RH levels]) shall be assumed for developing the work plan estimate.

5. Conduct the same matrix of experiments as described in Task 4, but using a surrogate spore forming microorganism such as *Bacillus subtilis* or *B. atrophaeus.* If feasible, experiments using *B anthracis* described in Task 4 may be conducted simultaneously in same test chamber as surrogate organism. Biological indicators (BIs) shall also be included in the tests with *B. anthracis*. The selection of BIs shall be conducted in technical consultation with the WACOR.

6. Tests shall include a sufficient number of replicates, positive controls, and blanks - consistent with previous projects.

7. Prepare three drafts of a test report (a draft for WACOR review and approval; a revised draft for peer and QA review; and a final) which shall include the test conditions, methods, quality assurance, and results of the tests conducted per the requirements of this SOW. The report shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

IX. QUALITY ASSURANCE

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action; see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP shall be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

X. DELIVERABLE SCHEDULE

1. Transfer of project data shall occur via electronic mail at the conclusion of each test. These data shall include, where appropriate, fumigant level, temperature, RH, and viable organism counts for test and control coupons.

Task	Begin date	Completion Date
1	Upon receipt of WA approval	IAW contract terms and conditions
2	As soon as possible	1 month after begin date
3	As soon as possible	1 month after begin date
4	Completion of Task 3	7 months after start of experiments under this task
5	Simultaneous with Task 4	7 months after start of experiments under this task
6	As soon as possible	Final draft of report due no later than August 31 2013.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Methyl Bromide Decontamination of Materials Contaminated with Anthrax	
Description:	Parametric tests wil be conducted at low T and RH	
Project ID:	C.2.3.1.3	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	IV	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Existing QAPP	
QAPP Status 2:	Not Applicable	
QAPP Status 3:	Not Applicable	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-C-10-001
	Work Assignment Number:	N/A
	Delivery/Task Order Number:	N/A
	Modification Number:	N/A?
	Other:	N/A

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes — Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

Decontamination of Soil Contaminated with B. anthracis, 11/17/11, 11/21/11

Does the QAPP require *any* revision by the contractor**

Amendment(s) will be needed

No — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles.* ?

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
R2 and R5	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

9/24/12		Ramona Sherman 9/24/12	
Joe Wood NHSRC-DCMD Technical Lead Person	09/24/2012 Date	- QA Staff Member	09/24/2012 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature pege of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified.

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified, meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified.

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification, as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination

between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations (including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING, DATA REDUCTION, AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified (*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed.

8.3 The responsible party(-ies) for implementing corrective actions shall be identified.

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP** QAPP requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all

requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-23

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Methyl Bromide Decontamination

Contractor	Specify Section and paragraph of Contract SOW
BATTELLE MEMORIAL INSTITUTE	As Original

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
Work Assignment Amendment 01 shall revise the original Statement of Work per the attached revised SOW (reduces test runs from 20 to 15; reduces 48 hr test runs from 20 to 10 and reduces draft reports from 3 to 2).

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	10/21/2009 To 08/31/2013		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Joe Wood (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-5029 FAX Number: 919-541-0496
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK
Contract EP-C-10-001

Work Assignment #3-23
Amendment 01

I. TITLE

Methyl Bromide Decontamination of Materials Contaminated with Anthrax

II. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from date of award - August 31, 2013.

III. SUMMARY OF OBJECTIVES

This work will provide data on the effectiveness of methyl bromide (MeBr) to inactivate *B. anthracis* spores on a number of materials, at ambient temperature and relative humidity (RH).

IV. RELEVANCE

The results of these tests will provide the decontamination technology user and stakeholder with high quality, peer-reviewed data on the effectiveness of MeBr to decontaminate a number of indoor and outdoor materials contaminated with *B. anthracis* spores and a surrogate. Tests will be conducted at typical room temperature and room RH. The results of the work will be made available to the homeland security and emergency response community through published reports, journal papers, and/or conference presentations/proceedings. The information will also be used to develop guidance documents pertaining to specific threat agents and release scenarios.

V. BACKGROUND

The U.S. Environmental Protection Agency (EPA) has the responsibility for protecting human health and the environment from accidental and intentional releases of hazardous and toxic materials. According to Homeland Security Presidential Directive 10 (HSPD-10), the EPA is tasked with developing strategies, guidelines, and plans for decontamination of persons, equipment, and facilities following a biological weapons attack. In response to this directive, the EPA Office of Research and Development (ORD) National Homeland Security Research Center's (NHSRC) Decontamination and Consequence Management Division (DCMD) is investigating methods and technologies for the inactivation of spores (e.g., *Bacillus anthracis* Ames) on materials/surfaces. This work will build on the decontamination studies that have already been conducted.

VI. SCOPE

The primary purpose of the study is to investigate the use of MeBr fumigation to inactivate anthrax spores. Sufficient replicates, blanks, and positive controls shall be used, consistent with standard microbiological and quality assurance procedures, past work conducted by the contractor, and studies being currently conducted by the contractor.

VII. TECHNICAL APPROACH

For each decontamination test, the effort shall include the recovery of viable agent from each material before (positive control) and after decontamination. Five replicates for each agent-material combination shall be included in each experiment. All experiments described below shall be approved by the EPA Work Assignment Manager (WACOR) prior to commencement. Test and analytical methods shall be adopted from past or on-going efforts, in technical consultation with the WACOR.

VIII. TASKS

The Contractor shall perform the following tasks after receiving an approved Work Assignment and preparing a Work Plan in accordance with contract terms and conditions:

1. Prepare an amendment to the Quality Assurance Project Plan (QAPP) that was developed under WA 2-01 (Decontamination of Soil Contaminated with *B. anthracis*) for the experiments listed in this SoW. Microbiological procedures, coupons, and measurement of temperature, RH, and MeBr fumigant concentrations, etc. shall be consistent with procedures used under previous projects with EPA.

2. The contractor shall build and test the experimental chamber that will be used for the testing described in this Work Assignment (WA). The chamber shall be capable of maintaining temperature, relative humidity, and methyl bromide concentrations as described in this WA. The chamber shall be designed to allow for automated data acquisition and control (if feasible) and measurement for extended time periods.

3. Conduct experiments to quantitatively determine the effectiveness (log reduction) of inactivating *B. anthracis* (Ames strain) on six materials using MeBr gas. The materials for testing shall be selected in consultation with the WACOR at the time of developing the QAPP amendment (Task 1), and may include such indoor and outdoor materials such as the ceiling tile, carpet, glass, painted wallboard, wood, and concrete. Up to three or four MeBr concentrations shall be tested, with 3-5 different elapsed times. Elapsed times may be as long as 48 hours or more, for a maximum of 10 tests. The majority of tests shall be conducted at ambient temperature, with RH controlled to a low level, such as 45%. However, a few tests may be conducted at alternate RH and T. A total of 15 runs (number of concentrations tested x number of elapsed times tested x number of environmental conditions [T and RH levels]) shall be assumed for developing the work plan estimate.

4. Conduct the same matrix of experiments as described in Task 3, but using a surrogate spore forming microorganism such as *Bacillus subtilis*, *B. atrophaeus,* or *Geobacillus stearothermophilus.* If feasible, experiments using *B anthracis* described in Task 3 may be conducted simultaneously in same test chamber as surrogate organism. Biological indicators (BIs) shall also be included in the tests

with *B. anthracis*. The selection of BIs shall be conducted in technical consultation with the WACOR.

5. Tests shall include a sufficient number of replicates, positive controls, and blanks - consistent with previous projects.

6. Prepare two drafts of a test report (a draft for WACOR, peer, and QA review; and a final report, revised per WACOR, peer and QA review comments) which shall include the test conditions, methods, quality assurance, and results of the tests conducted per the requirements of this SOW. The report shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

IX. QUALITY ASSURANCE

The Contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action; see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP shall be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

X. DELIVERABLE SCHEDULE

1. Transfer of project data shall occur via electronic mail at the conclusion of each test. These data shall include, where appropriate, fumigant level, temperature, RH, and viable organism counts for test and control coupons.

Task	Begin date	Completion Date
1	As soon as possible	1 month after begin date
2	As soon as possible	1 month after begin date
3	Completion of Task 2	7 months after start of experiments under this task
4	Simultaneous with Task 3	7 months after start of experiments under this task
5	ongoing	ongoing
6	As soon as possible	Final draft of report due August 31 2013.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-24

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013	Eval of Gross Decontamination
	Base Option Period Number 3	

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Section 3.1

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 10/24/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract Option Period III. The contractor, under this WA, shall not duplicate any work completed under any previous WA. The effective date for this WA shall be from date of issuance through 8/31/13. No work shall be performed by the contractor prior to date of award.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
10/21/2009 To 08/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Emily Snyder (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-1006 FAX Number:
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK

EVALUATION OF GROSS DECONTAMINATION TECHNOLOGIES FOR REMOVAL OF IND CONTAMINATION FROM RESPONDER ASSETS

OMIS C.2.2.2

WORK ASSIGNMENT #3-24

TABLE OF CONTENTS

I. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall begin at date of award and end August 30, 2013.

II. SUMMARY OF OBJECTIVES

The performance of a HEPA Ultra Vacuum and a compressed gas duster shall be evaluated for the removal of simulated Improvised Nuclear Device (IND) fallout particles from two standard response asset test coupons. These coupons could represent surfaces found on the outside of response vehicles or sensitive equipment. This work is based on a similar evaluation recently accomplished under the EPA's Technology Testing and Evaluation Program (TTEP), which has developed the test methods, protocols, Quality Assurance Project Plans (QAPP), and facilities applicable to this Statement of Work for evaluation of a rotating jet technology for removal of IND particles. It is anticipated that these previously developed products will be used or adapted to the greatest extent possible. Modifications in contamination methods and detection may be necessary to study the effects of different size ranges of fallout particles.

The technology performance evaluations shall include the determination of the amount of any remaining contamination following application of the decontamination technologies, and shall evaluate specific parameters related to deployment of the technologies in an operational setting. Responders will use this data to determine if these technologies can remove IND fallout from response assets.

III. BACKGROUND

Federal Emergency Management Agency (FEMA) is working to prepare for response and recovery to an IND. As a part of these preparations, it is partnering with other government agencies, including the U.S. Environmental Protection Agency (EPA), to perform scientific studies to inform response and recovery. One of these efforts is the assessment of gross decontamination of surfaces contaminated with IND fallout. The EPA was chosen to perform this work because it has the responsibility for clean-up after an IND.

IV. TECHNICAL APPROACH

The Contractor shall adapt existing test methods, protocols, and Quality Assurance Project Plans (QAPP) and shall demonstrate and quantify the performance of Ultra HEPA vacuum and the compressed gas duster, under realistic conditions, for removal of fallout simulant from two coupon types. The Contractor shall evaluate the performance of the rotating jet technology including: the decontamination factor (DF), time required to achieve that decontamination factor, difficulty of using the technology under realistic conditions, and an estimate of the costs (including disposal and secondary wastes estimates), constraints, and other factors such as quantity of waste generated, which would accompany application of the technology in an urban decontamination scenario. The Contractor shall also document other pertinent information relative to the technology application such as equipment required, mobility issues associated with equipment, decontamination of equipment, work crew sizes, and PPE that will affect the technology's effectiveness.

V. TASKS

The Contractor shall prepare and submit a Work Plan according to the terms and conditions of the contract that addresses:

TASK 1: PREPARATION AND APPROVAL OF THE QAPP PLAN

The Contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved by EPA prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality. If possible the previous QAPP developed for evaluation of the rotating jet technology for removal of IND fallout shall be amended in place of constructing a new QAPP.

The QAPP shall include a rigorous demonstration of the final test methods and procedures to verify their efficacy. The draft QAPP will be reviewed by the EPA WACOR and the EPA Quality Assurance Manager. The contractor shall respond to comments and submit the QAPP for final approval to the EPA WACOR and EPA Quality Assurance Manager. The QAPP, including any amendments, must be approved by the USEPA in writing (e.g., signature on the approval page) prior to the start of any work.

TASK 2: GENERATION OF SIMULATED FALLOUT

The contractor shall amend the surrogate used in previous decontamination studies to incorporate smaller sized particles. The EPA WACOR will provide technical direction regarding the exact particle sizes. These shall be tagged with a different radionuclide than Cs-137 if necessary. The contractor shall also develop a method to reproducibly (± 25%) deposit the contaminant on 6 by 6 inch coarse aggregate concrete coupons in horizontal orientation.

The Contractor shall propose the method to be used to characterize the coupons, both before and after deposition of the contamination (at a minimum the characteristics, distribution, and amount of contamination), and after application of the decontamination technology.

TASK 3: TECHNOLOGY TESTING - EXECUTION

The contractor shall obtain coupons that are representative of response assets including sensitive equipment. The EPA WACOR will provide technical direction to determine what substrates to select. During testing and deposition relative humidity

shall be maintained and documented at 50% ± 10% RH and ambient temperature shall be maintained and documented at 75 deg F ± 3 deg F. Test coupons (5) and positive control coupons (2) shall be contaminated with simulated fallout and the test coupons shall be decontaminated using the HEPA Ultra Vacuum or the Compressed Gas Duster leaving the coupons in the horizontal orientation. The activities from the positive control coupons and the test coupons shall be used to calculate the decontamination factor. The Compressed Gas Duster will likely blow the contamination off of the coupon but does not collect these particles. At least 2 of these test coupons shall be decontaminated with a procedural blank in the same closed box or bag to evaluate cross contamination.

In addition to determining the decontamination factor, the Contractor shall evaluate time required to achieve that decontamination factor, difficulty of using the technology under realistic conditions, and an estimate of the costs (including disposal and secondary wastes estimates), constraints, and other factors such as quantity of waste generated, which would accompany application of the technology in an urban decontamination scenario. The Contractor shall also document other pertinent information relative to the technology application such as equipment required, mobility issues associated with equipment, decontamination of equipment, work crew sizes, and PPE that will affect the technology's effectiveness. The Contractor shall operate the equipment/technology being tested according to the procedures (i.e., standard operating procedures, method, instructions, etc.) provided by the vendor and included in the approved QAPP. The contractor is not expected to evaluate the functionality of sensitive equipment if it is selected for testing.

TASK 4: TECHNOLOGY REPORT

The Contractor shall perform data analysis to determine percent removals and decontamination factors for the above tests and provide a technical report which shall document the results of Task 3, including all data generated.

VI. DELIVERABLE SCHEDULE

1. On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress, problems encountered, monthly and cumulative financial expenditures, and cost and schedule variance.

2. Bi-weekly conference calls shall be established between the EPA WACOR and the contractor project officer. During these conference calls the contractor shall report on progress made in the project and any technical issues encountered in implementation of the test plan.

3. Within 30 working days of the issuance of this Work Assignment, Quality Assurance Project Plan (QAPP) shall be provided to the EPA, in both electronic format (Microsoft Word, and Adobe), for Task 1-3. The EPA WACOR will then coordinate peer and EPA QA review of the QAPPs. The contractor shall then address any comments resulting from these reviews within 30 working days of receipt of the comments. The contractor shall then provide a final copy of the QAPP both in electronic and hard copy for EPA Approval. Work covered in this contract shall not begin until the QAPP has been approved by the EPA Quality Assurance Manager. The QAPPs shall contain work plans detailing how the experiments will be run and include a timetable for task completion. The Contractor shall adhere to QA requirements as delineated in "Attachment #1 and 2" to this Statement of Work (SOW).

4. A single draft technical report documenting the results of all tasks shall be submitted to the WACOR no later than 1 month after completion of Task 3. The WACOR will review the draft report, coordinate a peer review and QA review, and provide all comments (WACOR, three peer reviewers, QA) to the Contractor within 30 calendar days of receipt of the draft. The contractor shall resolve these comments within 14 calendar days of their receipt and the final technical report will be accepted by the WACOR after all comments have been resolved.

VII. REPORTING REQUIREMENTS

1. Data generated as a result of this effort shall be shared with the EPA WACOR for internal EPA use.

2. Laboratory data shall be transferred electronically to the EPA WACOR after the conclusion of each task.

3. **Any** products (test plans, conference proceedings, and reports) using the data generated under this Work Assignment shall be subject to one internal EPA review and one external review and must go through EPA's clearance process.

4. The report and any other products using the data generated under this SOW shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

5. Prior to submission of the draft data brief, all of the data shall be given to the EPA WACOR in electronic format, specifically Microsoft Excel® spreadsheets. The data contained in these spreadsheets shall be presented and annotated so as to be readily understandable to a wide audience.

6. Copies of any internal audit reports and responses shall be sent to the EPA WACOR in a timely fashion. The WACOR and EPA Quality Assurance Manager shall be immediately notified of any critical findings.

7. The contractor shall document all data analyses including statistical models and related assumptions.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-26

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013	Radiological Contam & Decontam
	Base Option Period Number 3	

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Sections 2; 3 and 7

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for Option Period III (09/01/12 - 08/31/13). The Contractor, under this WA, shall not duplicate any work completed under any previous WA. The effective date for this WA shall be the date issued by the Contracting Officer. No work shall be performed by the Contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
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5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	10/21/2009 To 08/31/2013		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:		Cost/Fee:	LOE:
Cumulative Approved:		Cost/Fee:	LOE:

Work Assignment Manager Name: Jeff Szabo (Signature) (Date)		Branch/Mail Code: Phone Number: 513-487-2823 FAX Number: 513-569-7052
Project Officer Name: Kathy Martin (Signature) (Date)		Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name: Adam Meier (Signature) (Date)		Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107
Contracting Official Name: Matthew Growney (Signature) (Date)		Branch/Mail Code: Phone Number: 513-487-2029 FAX Number: 513-487-2109

STATEMENT OF WORK

Contract Number EP-C-10-001
WA 3-26

I. TITLE

Using the EPA Experimental Design Protocol for Radiological Contaminant Persistence and Decontamination in Drinking Water Pipes

II. PERIOD OF PERFORMANCE

Issuance through August 31, 2013

III. BACKGROUND

The EPA's National Homeland Security Research Center (NHSRC) conducts research to protect, detect, respond to, and recover from terrorist attacks on the nation's water and wastewater infrastructure. Among concerns of such attacks is the adsorption of contaminants introduced into drinking water distribution systems to pipe walls and any corrosion or biofilm on interior pipe surfaces. Adsorbed contaminants could slough off over time, potentially endangering public health and prolonging the effects of the attack. Research is needed to better understand the adherence and persistence of selected contaminants on pipe walls and methods for successful decontamination and treatment.

Multiple research studies have been conducted to determine the adsorption of particular chemical, biological, and radiological contaminants to various drinking water pipe materials and test various methods to destroy, reduce, or remove adsorbed contaminants. Experimental designs have varied among these studies for both adsorption and decontamination. While useful data has resulted from studies conducted to date, an experimental design was needed that incorporates and improves the most effective design approaches and addressing lessons learned from the previous studies. Many priority contaminants have not yet been studied and the use of such a design will permit increased confidence, continuity, and comparability of results across studies.

The Contractor developed and tested an *Experimental Design Protocol for Chemical, Biological, and Radiological Contaminant Persistence and Decontamination in Drinking Water Pipes* under Blanket Purchase Agreement GS23F001L-3 and WA1-16 under contract EP-C-10-001. To test the experimental design protocol, the Contractor performed persistence testing with chlordane applied to surfaces that simulate cement-lined pipe as well as polyvinyl chloride (PVC) pipe and sodium fluoroacetate (SFA) applied to simulated cement-lined pipe followed by decontamination testing with flushing and hyperchlorination. This work was repeated using a *Bacillus globigii* (as surrogate for pathogenic *Bacillus anthracis*).

IV. OBJECTIVE

The objective of this Work Assignment is using the previously developed EPA *Experimental Design Protocol for Chemical, Biological, and Radiological Contaminant Persistence and Decontamination in Drinking Water Pipes* to quantitatively determine the adsorption propensity of the selected priority surrogate radiological contaminants to various drinking water pipe materials. If persistence is observed, methods to decontaminate the affected pipe surfaces will be tested.

V. SCOPE

Under this work assignment, the Contractor shall assess the persistence of surrogate radiological contaminants on drinking water infrastructure (cement mortar and PVC). If persistence is observed, the contractor shall attempt decontamination through simulated flushing and addition of decontamination agents. The decontaminating agents will be determined in conjunction with the WACOR, but could include pH adjustment (acid or base) or NSF-60 certified cleaning agents. The contractor shall use the following contaminants as model surrogate radionuclides:

- Cesium (stable cesium chloride)
- Strontium (stable strontium chloride)
- Cobalt (stable cobalt chloride)

The contractor shall use the previously developed persistence and decontamination protocol using biofilm annular reactors and experimental matrices. The protocol was developed under Blanket Purchase Agreement GS23F001L-3 and WA1-16 under contract EP-C-10-001 and described in the following reports delivered to EPA:

- Results Report from the Study of Chemical, Biological, and Radiological Contaminant Persistence and Decontamination in Drinking Water Pipes (September 2010)

- Report from the Study of Biological Contaminant Persistence and Decontamination in Drinking Water Pipes Using the EPA Persistence and Decontamination Experimental Design Protocol (August 2011)

VI. TASKS

The Contractor shall perform the following tasks:

Task 1. Prepare Quality Assurance Project Plan

The Contractor shall develop data quality objectives, which in turn shall serve as the basis for the quality assurance plan. The Contractor shall prepare a Quality Assurance Project Plan (QAPP) that complies with all requirements delineated under "Quality Assurance" below. The EPA WACOR will provide technical direction to the Contractor if necessary.

Task 2. Examine Radionuclide Persistence and Attempt Decontamination

After EPA approval of the QAPP, the Contractor shall conduct experiments following the experimental design protocol and deliver a draft report of results. The test experiments shall include contaminants and pipe materials approved by the EPA WACOR. EPA will review the draft report and provide comments and changes within 15 days after receiving the draft. The Contractor shall incorporate any changes and deliver a final report within 30 days following receipt of EPA comments.

DELIVERABLE SCHEDULE

Task 1. A detailed Work Plan shall be provided in accordance with terms and conditions of the contract.

Task 2. QAPP within 60 working days following approval of the Work Plan.

Task 2. Draft test report within 180 days following EPA approval of the QAPP. Final test report, and experimental data within 30 days following receipt of EPA comments and no later than 8/31/13.

REPORTING REQUIREMENTS

On a monthly basis for the duration of the project, the Contractor shall submit in electronic format a status report summarizing technical progress, problems encountered, and budget expended to date.

QUALITY ASSURANCE

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-27

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-10-001	10/21/2009 To 08/31/2013 Base Option Period Number 3	Scalability Challenges

Contractor: BATTELLE MEMORIAL INSTITUTE

Specify Section and paragraph of Contract SOW: Section 3.1

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/01/2012 To 08/31/2013

Comments:
New Work Assignment (WA) for contract Option Period III (9/01/12 - 8/31/13). The Contractor, under this WA, shall not duplicate any work completed on any previous WA. The effective date for this WA is 2/1/2013. No work shall be performed by the Contractor prior to the WA effective date.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 10/21/2009 To 08/31/2013 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: John Drake (Signature) (Date)	Branch/Mail Code: Phone Number: 513-235-4273 FAX Number:
Project Officer Name: Kathy Martin (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4502 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Charles McCormick (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2047 FAX Number:

Performance Statement of Work
Work Assignment #3-27

EVALUATION OF SCALABILITY CHALLENGES FOR RADIOLOGICAL DECONTAMINATION TECHNOLOGIES IN THE URBAN ENVIRONMENT

I. PERIOD OF PERFORMANCE

The period of performance for this Work Assignment (WA) shall be from Feb 1, 2013 through August 31, 2013.

II. PURPOSE

NHSRC has conducted in-house and extramural experimental work to evaluate the efficacy and applicability of a number of radiological decontamination technologies. This work has focused on decontamination of various radionuclides, from a range of urban building materials, based on accepted radiological dispersal device (RDD) scenarios. Many of these technologies may, or may not, be applicable to decontamination on a wide area scale. This work shall evaluate the potential challenges involved in applying currently available radiological decontamination technologies in the wide area urban environment after an RDD incident and provide recommendations for further development of promising methods and processes.

III. BACKGROUND

The U.S. Environmental Protection Agency (EPA) has the responsibility for protecting human health and the environment from accidental and intentional releases of radiological materials. The National Response Framework (NRF), Nuclear/Radiological Annex designates EPA as a supporting agency for the long term recovery phase of a response. The EPA Office of Research and Development (ORD) National Homeland Security Research Center's (NHSRC) Decontamination and Consequence Management Division (DCMD) has conducted performance evaluations for technologies aimed at the decontamination of urban materials. These demonstrations have generated performance data that can be used to support decisions concerning the selection and use of decontamination technologies for urban materials contaminated with specific radiological threat agents. The results of that work are available to the homeland security community through published reports, journal papers, information systems and conference presentations/proceedings. The information may also be used in clean up guidance pertaining to specific threat agents and release scenarios.

IV. TECHNICAL APPROACH

The Contractor shall (1) identify currently available radiological decontamination technologies applicable for removal of cesium from urban surfaces following an RDD event with emphasis on those applicable to wide area decontamination (surface areas >100 m^2), rapid deployment, and high decontamination rates (>5 m^2/hr), (2) evaluate the challenges and issues related to scalability and wide area deployment (e.g. technical feasibility, logistics, operational viability, decontamination performance, community acceptance, waste disposition, cost, etc.) relative to postulated recovery scenarios following an RDD event, and (3) provide a list of knowledge/capability gaps and potential solutions that if addressed could potentially improve the performance of the technologies evaluated. For example, technologies with slower application rate can be considered if the technology and/or application process could be modified to increase the speed of application.

V. TASKS

The work that shall be performed is organized into five separate tasks. Task 1 shall involve the development of the Work Plan for execution of the study and reporting of results. Task 2 shall develop a secondary data Quality Assurance Project Plan (QAPP). Task 3 shall develop a compendium of currently available radiological decontamination technologies potentially applicable to the wide area decontamination scenario. Task 4 shall evaluate the challenges and issues related to scalability and deployment of the identified technologies. Task 5 shall identify knowledge and/or capability gaps and potential solutions for technology performance improvement. Task 6 shall consist of preparation of a summary report documenting the results of all tasks.

TASK 1: PREPARATION OF WORK PLAN

The Contractor shall develop a detailed Work Plan for execution of Tasks 2 through 6, in accordance with the contract clause, B-2, Work Assignments (EPAAR 1552.211-74).

Note: Work plan requested within 15 days and COI plan within 20 days of receipt of the work assignment.

TASK 2: PREPARATION OF QUALITY ASSURANCE PROJECT PLAN (QAPP)

The Contractor shall prepare a secondary data QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf based on the type of research that is being conducted. The Contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this contract package (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The draft QAPP will be reviewed by the EPA WACOR and the EPA Quality Assurance Manager. The Contractor shall respond to comments and submit the QAPP for final approval to the EPA WACOR and EPA Quality Assurance Manager. The QAPP, including any amendments, must be approved by the U.S. EPA in writing (e.g., signature on the approval page) prior to the start of Task 3. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

TASK 3: PREPARATION OF LIST OF POTENTIAL WIDE AREA DECONTAMINATION TECHNOLOGIES

The Contractor shall develop a compendium of currently available radiological decontamination technologies applicable for removal of cesium from urban surfaces following an RDD event with emphasis on those applicable (or potentially applicable) to wide area decontamination (surface areas >100 m^2), rapid deployment, and high decontamination rates (>5 m^2/hr). Potentially applicable technologies would include those which could be modified to meet these wide area performance goals. For example, technologies with slower application rates can be considered if the technology or application process could be modified to increase the speed of application. The compendium shall include information such as the technology description, demonstrated and/or advertised performance (e.g. decontamination rate, decontamination factor, etc.), vendor information, cost information, application procedures, surface applicability, waste generation, etc. Information sources shall include previous USEPA and USDOE decontamination technology investigations and guidance documents, ongoing and historic radiological decontamination projects and studies (e.g. Fukushima, Chernobyl, TMI, Superfund, DOE legacy cleanups), foreign sources (e.g. UK-GDS, Environment Canada, etc.), technical conference proceedings, industry websites, and additional sources as may be discovered during conduct of the task. The compendium shall be logically organized so as to facilitate communication of the information to stakeholders. The compendium shall be provided to EPA for review and comment by EPA prior to commencement of Task 4.

TASK 4: EVALUATION OF CHALLENGES AND ISSUES RELATED TO TECHNOLOGY DEPLOYMENT

The Contractor shall evaluate the challenges and issues related to scalability and deployment of the technologies identified in Task 3 in a wide area scenario. This evaluation shall address all significant areas including technical feasibility, operational viability, logistics, decontamination performance, community acceptance, waste disposition, rate of application, labor and materials to implement, and cost, as well as any other significant challenges identified during the conduct of the task.

TASK 5: IDENTIFICATION OF KNOWLEDGE GAPS AND POTENTIAL SOLUTIONS

From the compendium produced in Task 4 the Contractor shall identify knowledge and/or capability gaps and potential solutions which would address the challenges and issues identified in Task 4.

TASK 6: SUMMARY REPORT

The Contractor shall provide a report which documents the results of Tasks 3, 4, and 5, including references to all source materials.

VI. DELIVERABLE SCHEDULE

Task 1: A detailed Work Plan shall be submitted in accordance with the terms and conditions of the contract. See: Work Assignments, Id.

Task 2: A draft QAPP shall be submitted within 30 working days after EPA approval of the Work Plan submitted under Task 1.

Task 3: Within 30 working days after EPA approval of the QAPP submitted under Task 2, the Contractor shall submit a draft compendium of currently available radiological decontamination technologies applicable to wide area decontamination. EPA will review the draft compendium and provide comments to the Contractor within 30 days of receipt. Task 4 shall not begin until resolution of EPA comments.

Task 4: The Contractor shall produce a draft document which describes the conduct and results of its evaluation of the challenges and issues related to wide area deployment of the identified decontamination technologies. EPA will review the draft document and provide comments to the Contractor.

Task 5: The Contractor shall produce a draft document which presents knowledge gaps and potential solutions identified during the study. EPA will review the draft document and provide comments to the Contractor.

Task 6: The Contractor shall produce single draft summary report including the results of all tasks, which shall be submitted to the WACOR no later than July 31, 2013. The WACOR will review the draft report and provide comments to the Contractor within 30 days of receipt. The final technical report will be accepted by the WACOR after all comments have been resolved.

VII. REPORTING REQUIREMENTS

- All final products, (e.g., technical reports) generated under this WA shall be peer reviewed by at least one external EPA (non-NHSRC) and at least one internal EPA (NHSRC) reviewer, as well as a review by a technical editor and by NHSRC management to prevent perceived policy statements from being included in the reports. The WACOR will coordinate the peer review of the draft documents and submit comments to the Contractor for product revision and comment response.
- All data shall be transferred to the WACOR in electronic format, in MS Excel worksheets, including submission of the draft summary report. The worksheets shall be adequately commented to ensure that the data presented is clearly identifiable.
- All software application files delivered to the Government shall be Microsoft Office 97, or higher. All software and electronic applications shall be supported by a VPAT (Voluntary Product Accessibility Template) adequate to demonstrate that software application files conform with the requirements relating to accessibility as detailed to the 1998 amendments to the Rehabilitation Act, particularly, but not limited to, §1194.21 Software applications and operating systems. http://www.section508.gov/
- On a monthly basis for the duration of the project, the Contractor shall submit, in electronic format, status reports summarizing technical progress (including estimated percent of project completed), problems encountered, monthly and cumulative financial expenditures, and cost and schedule variance.
- All products developed under this SOW (e.g., the above mentioned summary report) shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

QUALITY ASSURANCE SURVEILLANCE PLAN

Performance Requirement	Measurable Performance Standard	Surveillance Method	Incentive/Disincentives
Timeliness: Services and deliverables shall be in accordance with schedules expressed in accepted work plan, unless amended or modified by EPA	For each period of performance no more than 10% of the submitted deliverables shall be submitted more than six (6) calendar days past the due date established in the accepted work plan.	EPA work assignment CORs will closely monitor task milestones and deliverable schedules and inform the EPA PO when deliverables are not received within this performance standard. The EPA PO will keep a record of these incidents and determine if the performance standard has been met	No more than 10% of deliverables may be untimely submitted. Performance inconsistent than this standard will be reported in the CPARS reporting system with the rating not higher than 'unsatisfactory' in the category of "Timeliness of Performance" .
Management and Communications: The contractor shall maintain contact with the EPA CO, Cont ract Level COR, and work assignment COR throughout the performance of the work assignment shall promptly bring potential problems to the attention of the WAM and the Project Officer.	Any issue impacting project cost, o r quality shall be brought to the attention of the appropriate EPA personnel within 5 days of the occurrence.	Performance under all active work assignments will be closely and actively reviewed by the Program Manager and the Work Assignment Manager verify reported issues and/or identify unreported issues.	If more than one incident occurs where the contractor does not meet the performance standard for reporting issues in a given contract period, a rating of 'unsatisfactory' will be reported in CPARS under the category of Business Relations.
Cost Control: The contractor shall monitor, track, and accurately report the level of effort, labor costs, other direct costs, and fee expenditures to EPA through monthly progress and financial reports . The contractor shall assign appropriately skilled personnel to all tasks , practice time management, and provide current, accurate, complete, and timely billings .	If the contractor fails to manage and control cost, any resultant overrun cannot exceed the to total contract obligation.	All active work assignments under the contract will be reviewed by the EPA WAM under the contractor's monthly progress report and financial reports to compare actual costs against those approved.	An overrun that exceeds the total contract obligation without timely prior notification shall be considered and rated as' unsatisfactory' in the CPARS category of cost control, regardless of whether the cost id later determined to be allowable..